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No. 3.—JOHNE'S DISEASE, INCLUDING JOHNE'S DISEASE IN SHEEP*

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JOHNE'S DISEASE

The subject of Johne's disease was last discussed at a Congress of the National Veterinary Medical Association in 1929, when a report was presented by G. W. Dunkin. With a subject such as this, it is too much to expect that great advances will have been made in the short period of four years, when one remembers the long incubation period of the disease, the special difficulties in cultivating the causal organism and, finally, the high cost of experimental work, a deterrent which has been acutely felt during the last two or three years. Nevertheless, I believe it may prove valuable to review the present position. In compiling this report I have confined attention to the practical side of the subject and have endeavoured to bring out certain points which are likely to assist the veterinarian in his daily work. No attempt has been made to give detailed supporting evidence to many rather general statements and extensive references to the literature have been omitted.

JOHNE'S DISEASE IN CATTLE

Prevalence and Economic Importance

It is unnecessary in this report to lay stress upon the great importance of Johne's disease to agriculture. The widespread dissemination of Johne's disease is, of course, largely due to the absence of any official restrictions upon the traffic in cattle. So far as existing knowledge goes, I believe the evidence as to the prevalence and distribution of the disease in this country is as set out by Dunkin in his report to Congress in 1929 and in his address to the Midland Counties Division of this Association in 1931. The only way to obtain more exact knowledge of the incidence of the disease would be to conduct complete herd tests with johnin on a large number of unselected herds in various parts of the country, avoiding herds where a serious attempt had been made at controlling the disease. The data would be rendered still more valuable if the results of tuberculin tests carried out at the same time were also available. It cannot be too strongly emphasised that only a part of the picture is revealed by the statement that in a given herd the annual loss by death from Johne's disease reaches a certain percentage. In the course of the work of this Institute complete herd tests have been carried out on seven herds and the results are summarised in Table I. (See overleaf.)

These findings are not unlike those reported in the literature, which show that in affected herds the proportion of reactors not uncommonly averages 30 or 40 per cent. The reactor incidence is highest among animals over two or three years of age, but it is stated that reactions also sometimes occur in animals below twelve months of age and even in calves not more than four or five weeks old. Thus it will be seen that the situation is not sensibly different from that of the other great plagues which afflict cattle in this country, namely, tuberculosis, contagious abortion and chronic streptococcus mastitis. In Johne's disease, as in the three other diseases named, there is the same relatively high proportion of latent infections.

Symptoms and Course of the Disease

The symptoms in advanced cases are so well known that no description is required here. At an earlier stage the existence of the disease is indicated by a falling-off in the milk yield and by periods of unthriftiness, with or without intermittent attacks of slight diarrhœa, although the appetite and rumination are in the main little disturbed. Such signs are more likely to appear in animals between two and five years of age and, especially in the winter months, when climatic conditions are unfavourable, in animals after the first or still more frequently after the second calving, and in cows with a particularly heavy milk yield. One point to be noted is that diarrhœa is by no means a constant symptom in the early stages.

It has been pointed out by a number of observers, however, that months and even years may elapse before symptoms appear in animals which are known from johnin testing to be infected, and no doubt many of these leave the herd through causes unconnected with Johne's disease. Animals which have once shown

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DEPT. OF VET. MEDICINE

TABLE I.

THE INCIDENCE OF THE DISEASE IN SEVEN HERDS, AS JUDGED BY THE RESULTS OF TESTS WITH JOHNIN, 1930 TO 1933.

Herd.	County.	Dates of tests.	No. of animals in various categories.	Result of Johnin Test.			Percentage.	
				Pos.	Doubtful.	Neg.	Pos.	Pos. and Doubtful.
A	Warwick	June, 1931	Bull 1 Cows and Heifers 83 84	 3 3	 3 3	1 79 80		7·1
C	Herts.	Nov., 1931	Cows 96 Heifers 26 122	16 3 19	15 15	65 23 88	15·5	27·8
E	Beds.	Feb. and May, 1930	Bull 1 Cows 32 Stores 37 Calves 4 74	 9 (6+, 2 ?) 11 (2+, 2 ?) 20	 7 (4+, 1 ?) 13 (5+, 4 ?) 20	1 16 (6+, 2 ?) 13 (4+) 4 34	27	54
F	Herts.	Mar. and June, 1930	Bull 1 Cows 11 Heifers 8 20	1 2 (1+) 3 (1+, 1 ?) 6	 1 1 2	 8 (3+) 4 12	30	40
G	Bucks.	May and Sept., 1930	Bull 1 Cows 16 Stores 23 40	 4 3 7	 1 3 4	1 11 17 29	17·5	27·5
H	Sussex	Jan., 1933	Bull 1 Cows 19 Heifers 25 45	 6 (6+) 7 (4+, 1 ?) 13	 3 (3+) 5 (4+) 8	1 10 (5+, 3 ?) 13 (9+, 2 ?) 24	28·8	46·6
I	Wilts.	Dec., 1931	Cows 62 Heifers 56 (12 to 30 months) 118	9 3 12	6 2 8	47 51 98	10·1	16·9

Notes on Table I.

(1) The figures in brackets show the numbers of animals positive or doubtful to a tuberculin test, where this was applied at the same time as the johnin test.

(2) In Herds E, F, and G, eradication measures were attempted, and the results given are in each case those of the first two tests applied.

(3) Tests were made by the double intradermal method, using 0·2 c.c. of (Sheather) johnin for each injection. The tuberculin used in herds E and F was provided by Dr. Sheather: that in herd H by Professor Buxton. All the readings and most of the injections were made by one person (F. C. M.).

(4) A, C, G, and I were being regularly tuberculin tested, the number of reactors present being negligible at the date shown; herd F was maintained under good conditions; herds E and H were of the ordinary commercial type and the proportion of tuberculous animals was high, especially in herd E.

(5) Starting in 1929, herd A had been reconstituted by the purchase of heifers from Ayrshire which had passed the tuberculin test and were due for first calf. Hence, no animal tested in 1931 was more than about five years old. Prior to 1929, there had been some trouble, which was believed to be due to Johne's disease, and a diagnosis had been established in two animals.

The owners of herds C, G, and I had suspected the existence of Johne's disease but did not look upon it as serious. It will be noted that the proportion of reactors in the four regularly tuberculin-tested herds, A, C, G, and I. was definitely lower than in herds of the ordinary type.

In herd F the disease had caused much loss for several years. In herds E and H the losses from Johne's disease had been so high that the owners feared they would have to give up keeping cattle.

In all the herds the existence of Johne's disease was subsequently proved by *post-mortem* examination of a number of positive or doubtful reactors.

symptoms of the disease, however, will usually die from it sooner or later. Nevertheless, after the age of five years, a degree of immunity develops which, in some animals, is strong enough to prevent any marked decline in condition for a number of years, although from time to time unmistakable symptoms appear. At intervals such animals may even show considerable improvement in condition, especially when housed, but whether complete recovery occurs is not known. In Johne's disease the importance of "environment," using the term in its widest sense, cannot be over-estimated and the conditions under which an animal is kept and fed will often decide the issue. I have myself had experience of a johnin reactor where clear symptoms developed after calving but where the animal afterwards considerably improved in condition, though still infected when slaughtered eight months later. The following case, described by Hagan (1932), is of so much interest in illustrating the remarkable recuperative powers possessed by some animals that the full history is worthy of repetition.

> In November, 1926, three cattle nine months old were drenched with minced intestine from a case of Johne's disease, a test with avian tuberculin seven months later indicating that they had become infected. The first and second animals died of Johne's disease 13 and 25 months after infection, both having calved in the interval and the first symptoms in both cases having appeared at about the time of calving. Shortly after calving the third animal also began to show symptoms and soon became a well-marked case. It was supposed that she would die like the other two, but instead she began eating again and improved in condition until soon afterwards she was in apparently normal health. She was then served and in due time calved, but before calving she again showed symptoms. Prior to this time, Johne's bacilli had been found on a number of occasions in smears of the rectal mucosa and she had also regularly reacted to avian tuberculin, as well as to the complement-fixation test. After the second calf she began to scour and within three weeks was so weak that in the mornings she was unable to rise without assistance, and it was thought that the end would come in a few days. Instead of this she began to pick at hay and put on flesh. At this time she weighed 650 lbs., whereas six months previously she had weighed 1,100 lbs. Six months later her weight was more than 1,200 lbs., and still rising.
>
> Dr. Hagan, in a private communication dated May 19th, 1933, has been kind enough to give me the latest information about this animal. He states that she is now in fat condition and showing absolutely no signs of the disease, but that owing to cystic ovaries she is sterile. For several years she has not reacted to allergic tests and monthly examinations of her fæces by various concentration methods are negative, but her blood serum continues to fix complement. The intention is to keep her for several years and when she is eventually slaughtered to make a very thorough *post-mortem* examination.

Diagnosis

(1) DIAGNOSIS DURING LIFE.

The typical advanced case will present little difficulty and at earlier stages the nature of the condition can be conjectured with reasonable certainty from the symptoms and history. Where necessary, there are several expedients which can be adopted with a view to confirming the diagnosis. Thus, Johne's bacilli may be sought in smears of a particle of rectal mucosa; the bowel-washing method first suggested by Krishnamurti (1929) may be tried, or the fæces may be examined microscopically for acid-fast bacteria after treatment with 50 per cent. antiformin for 18 hours. In the more advanced cases it is said that the complement-fixation reaction may be of value. It is not my intention to discuss these methods of diagnosis but to consider allergic tests, the chief value of which is to detect the disease in its pre-clinical or early clinical stage.

Johnin.—Several brands of johnin are available for use in this country and no doubt the technique of preparing the reagent is still to some extent in a state of evolution. Major Dunkin's preparation is made by cultivating the organism on a liquid medium of somewhat complex composition, the full details of which have been published by him (1928). Johne's bacilli generally grow freely on this medium and the potency of the reagent before issue is controlled on allergic cattle. Dr. Sheather permits me to say that his johnin is prepared from heavy growths of Johne's bacillus on Sauton's synthetic medium containing *Bact. phlei* extract. It is most desirable that a standard technique for preparing johnin should be formulated. A step in this direction has already been taken by a committee of the Agricultural Research Council, but much more work must be done before the position in this respect can be said to be satisfactory. I do not wish to imply, however, that the brands of johnin at present available are of low or even of moderate value, and there is already plenty of evidence in this country to show that this is not so.

With regard to the methods of using johnin; in the United States the intravenous route is favoured, the animal's temperature being taken once or twice before injection and every one or two hours afterwards up to the twelfth hour. There is no doubt that by this means specific temperature reactions can be evoked in cattle infected with Johne's disease, but there are important objections to the method in practice: (i) the method is laborious and takes up considerable time; (ii) reactors sometimes show severe general disturbance, and occasional deaths have been recorded. It is stated, however, that disturbances of this sort may be diminished by warming the fluid before injection; (iii) dosage of the reagent is of some

importance, since too large doses may cause non-specific reactions; (iv) some owners may object to their animals being given intravenous injections.

Such objections do not hold when johnin is used intradermally, *viz.*, at the caudal fold site or in the skin of the neck. Certain disadvantages in using the caudal fold site have been pointed out by the Medical Research Council Tuberculin Committee. One which I have not seen mentioned is that some animals are in the habit of ducking the tail at the moment the needle penetrates the skin, with the result that the needle pricks the finger of the operator—a small point possibly, but sometimes a painful one!

Following upon the successful use of tuberculin in the skin of the neck by the double intradermal method, Dunkin adopted a similar method with johnin. I agree with those who favour this site, and from comparative experiments which I have conducted there can be no doubt that a second injection at the 48th hour is essential in many cases.

As to the nature of the reaction in frankly positive cases, this, as is now well known, is similar to that following an injection of tuberculin in a tuberculous animal, but in my experience—which it so happens has been chiefly with johnin prepared by Sheather, or on a medium similar to that used by him—the swellings, although quite definite and typical, do not in general attain the size of many tuberculin reactions. Also, it should be said that distinct pain may or may not be present.

A good reaction would be represented by an animal with an initial skin measurement of 7 mm., in which, after the second injection, the skin measurement had attained 22 or 25 mm. with diffuse œdema. Frequently, however, the greatest thickness recorded is not more than twice, or may even be rather less than twice, that of the normal skin, but there would be no hesitation in reading this as positive if the œdema was diffuse. A definite, positive reaction indicates infection with the Johne's bacillus. The literature on the subject contains numerous instances where such reactions have been confirmed by *post-mortem* examination, though the information given is not infrequently confined to bare statements. My notes contain records of 52 cattle which on *post-mortem* examination were proved to be infected with Johne's disease. Of these, 35 had given one or more unmistakable johnin reactions during life, three others gave suspicious reactions, seven were negative and seven were not tested.

An important matter for consideration is the significance of reactions which, for the purpose of the present description, may be called "doubtful." I am referring here to cases where 24 hours after the second injection a firm, painless circumscribed swelling about the size of a cob-nut, or perhaps rather larger, is present, around which, on careful palpation, no distinct œdema can be felt. The diameter of such a swelling may be roughly twice that of the thickness of the skin before injection. It is not a simple matter to assess the significance of swellings of this nature, but there are several ways of approaching the problem. One way would be to make thorough *post-mortem* examinations of a series of such cases. This would give a great deal of information but, unfortunately, it would be expensive and the failure to demonstrate Johne's bacilli would not be entirely conclusive. An indirect method of approaching the problem would be to conduct a large series of tests on animals which are certainly free from Johne's disease or any other condition, such as tuberculosis, which might conceivably affect the animal's capacity to react. In other words, the object would be to determine whether the swellings under consideration were due to non-specific causes. These conditions again are not too easily realised. On one occasion, however, I tested with Sheather johnin a herd of 85 Ayrshire cattle (Herd A, in Table I), composed mainly of first- or second-calvers, which was free from tuberculosis and in which at that time there was no reason to believe that Johne's disease existed. Six of the animals gave reactions which could be interpreted as positive or doubtful. Of the remaining 77, at the 72nd hour, three gave an increased thickness of 4 mm., six an increase of 3 mm., and with the rest the increase was not more than 2 mm. This result would lead one to think that with the particular johnin used the increase in skin measurement in animals which are free from tuberculosis and Johne's disease after two injections is negligible, and suggests that larger increases, such as those of the "doubtful" reactions now being discussed, are due to specific or non-specific supersensitiveness. More than this, I feel, cannot be said at present, and the situation will not become clear until much systematic research has been carried out.

In connection with attempts at eradicating the disease from three herds, I have tested a number of animals at intervals of three or four months over a period of about two years. To some extent this has given an opportunity of studying the behaviour of infected animals at successive tests, since most of them were put into isolation and not disposed of immediately. This has shown that reactions in individual infected animals vary in extent at successive tests and there may even on occasion be failure to react in subjects which react to a later test. Such results may be ascribed to lack of potency in the johnin, but, since all batches of johnin gave positive reactions in some animals, the more probable explanation, in my view, is that the allergic condition of infected animals may vary considerably from time to time. In the same

connection it is, of course, well known that in the early stages of infection and in advanced clinical cases the reacting power of the animal may be slight or absent.

Avian Tuberculin.—Avian tuberculin has also been recommended for the diagnosis of Johne's disease, and the value of this reagent for the purpose was proved long ago by O. Bang (1909, 1914). Hagan and Zeissig (1933) believe that by the intravenous route, if the doses are carefully graded, avian tuberculin is as good as, or even better than, johnin for detecting Johne's disease. By the intradermal route also, avian tuberculin is capable of causing reactions in animals suffering from Johne's disease, and my experience with the double intradermal method has been that the reactions are sometimes superior to those resulting from johnin. It is not suggested, however, that avian tuberculin should be used in place of johnin, partly because it is far more likely than johnin to cause reactions in tuberculous animals.

(2) DIAGNOSIS AFTER DEATH.

In fairly advanced cases this is generally not difficult, as the alterations in the intestine have by that time proceeded to the point where they can be recognised microscopically or Johne's bacilli can be found with comparative ease in smears from selected parts of the bowel. On the other hand, it must be recognised that a wasted condition of the animal before death is no criterion that obvious bowel lesions or large numbers of bacilli will be found *post-mortem*. Earlier cases may present considerable difficulty and more time-consuming methods, *e.g.*, examination of sections or cultivation of the causal organism are often required. It is probable, however, that in some reactors even efforts at cultivation, no matter how carefully carried out, will fail at times to reveal organisms, owing to the small numbers present and their unequal distribution and owing to difficulties from contaminating organisms.

(3) DIFFERENTIAL DIAGNOSIS.

(*a*) *Tuberculosis.*—This disease is mentioned, chiefly because it is important to consider whether cross-reactions with tuberculin or johnin occur with animals infected with either tuberculosis or Johne's disease. Incidentally, and contrary to what is sometimes stated, the two diseases quite commonly co-exist in the same animal. Probably the more widely-held view is that such cross-reactions do not occur. Plum (1932), however, has found from his experience of the double intradermal method of testing that tuberculous animals may give slight reactions not only with avian tuberculin but also with johnin, and Veenbaas and Swierstra (1932) have formed the same opinion. Looking at the question broadly, it might be concluded that allergy induced by the various members of the acid-fast group of bacteria would be in the main specific, but that less pronounced degrees of non-specific sensitisation would sometimes develop. The magnitude of such non-specific effects would depend partly upon the kind of acid-fast organism used for inducing the sensitive state, but in tests by the intradermal route the reactions might be recognised by an experienced observer as "atypical." According to this, then, it would be expected that tuberculous cattle, which happened to be passing through a phase of the disease in which their tuberculin sensitiveness was high, would also give some non-specific reaction if injected intradermally with johnin. I have myself come across two cases which appear to fall into this category, and in which, on careful cultural search *post-mortem*, Johne's bacilli could not be detected. It might be supposed that the converse would hold with cattle suffering from Johne's disease, but this would be less likely because the antigenic power of Johne's bacillus is not so high as that of the tubercle bacillus. If, therefore, it is accepted that such cross-reactions do occur, we may ask whether they are frequent and whether in routine testing there is much risk of confusion with specific reactions. If from a limited experience I had to answer these questions, I should say that, on the whole, with tuberculous animals cross-reactions are not common, but that when they do occur they might certainly be confused with specific reactions, at any rate, in the course of routine testing. The difficulty would not, in my opinion, be entirely removed by injecting the unsown medium as a control, although some reaction to this also would be expected in a highly sensitive animal. For these reasons it would appear to be an advantage with present knowledge to inject tuberculin and johnin side by side, except in animals known to be free from tuberculosis, as a guide in determining whether a slight reaction to johnin is specific or not. Houthuis (1932), from his experience in Holland, has arrived at a similar conclusion.

(*b*) *Infection of Cattle with Avian Tubercle Bacilli.*—On premises where tuberculous fowls are allowed access to cattle, these animals sometimes become infected with avian tubercle bacilli. This does not in general lead to symptoms and there is no suggestion that the condition may be confused with Johne's disease on clinical grounds. The matter is mentioned here because, just as cattle with Johne's disease react to avian tuberculin, so cattle infected with avian tubercle bacilli are liable to react to johnin, and also to some extent to tuberculin (Plum, 1932, and others). Infection with avian tubercle bacilli is more commonly met with in calves and is retrogressive in tendency, but Minett (1932), who has described the condition

in three herds of cattle in Great Britain, has found that cattle may sometimes retain the avian infection and continue to react to johnin for some time during adult life. Insufficient observations have been made to enable one to form a judgment as to the frequency of such infections, but the possibility should be borne in mind when cattle are being tested with johnin.

(*c*) *Strongylosis.*—Extensive infestation with nematode worms may lead to wasting in cattle, and especially in calves and young adults, and the symptoms are not unlike those of Johne's disease. Worm infestation may be diagnosed by the finding of large numbers of eggs, larvæ and adult parasites in the fæces, and by the improvement which follows removal to drier pasture, better feeding, and the administration of anthelmintics.

(*d*) *So-called "Sewage Poisoning."*—I am tempted to refer briefly to this subject in view of past litigation and the correspondence which has appeared in *The Veterinary Record* during the past twelve months. There is no scientific evidence that such a condition as poisoning with human sewage ever occurs in animals and there is at the same time the strong probability that in cattle Johne's disease is one of the conditions with which this supposed " poisoning " has been confused. In this connection it should be emphasised that cattle suffering from Johne's disease do not invariably die shortly after symptoms are manifested and that more or less prolonged recovery of condition is not uncommon with a change of food and environment.

Prevention

The following points come up for discussion when an endeavour is to be made to control the disease in infected herds.

(*a*) *Testing with Johnin and Isolation of Reactors.*—In the first place it should be made clear that it is hopeless to expect a real improvement by simply removing clinical cases as they arise and by cleansing their immediate surroundings. The first procedure must, therefore, be to carry out a johnin test of all animals above the age of about six months. In interpreting reactions it is a distinct advantage if the relative sensitiveness of the animals to johnin and tuberculin can be tested at the same time, a procedure which entails little extra trouble and no greater number of visits. Arrangements should then be made for the immediate isolation on a separate pasture or yard of johnin reactors and of all animals which, from their history or as a result of the test, are under suspicion. Clinical cases should, of course, be removed from the herd at the first suitable opportunity. The disposal of reactors is a matter for consultation between the owner and the veterinary surgeon in charge of operations. In this consultation there will be considered the age of the animal, its condition as regards pregnancy, its milk yield, its fitness for slaughter and its status as regards other diseases, *e.g.*, tuberculosis and, if the information is available, abortion and mastitis. It will be remembered that younger animals are more likely to pass into the clinical stage than older ones and that animals carrying the first or second calf are especially liable to break down after parturition. In any case, the reacting group should be carefully watched by the owner in order that any showing signs of wasting may be promptly sold for slaughter. It will probably be a relief to the owner to be assured that the fact of an animal's reacting does not imply its immediate expulsion from the herd.

It is recommended that further tests of the presumably healthy section of the herd should be made after three, six and twelve months and afterwards at intervals of, say, six months, so long as the circumstances appear to warrant it.

(*b*) *Prevention of Further Infection.*

(1) Since the Johne's bacillus is a member of the acid-fast group, it may be anticipated that it is endowed with considerable powers of resistance to destruction outside the body and it has been suggested that its viability in the face of natural destructive agencies is even greater than that of the bovine tubercle bacillus.

On completion of the first herd test, the premises should be cleansed as far as practicable and this should be repeated at intervals. This involves removal of the manure from standings and its disposal on cultivated land, to which cattle and sheep have no access; lime washing; cleaning of yards and preventing cattle having access to manure heaps. With regard to pastures—the application of lime has been advised, for the purpose of assisting the destruction of the organisms, but it is extremely doubtful if the labour and expense of this justify what, in my opinion, is likely to be a slight gain. On the other hand, manure on infected pastures should certainly be broken up by thorough harrowing, as recommended by Dunkin (1929, 1931), and the pasture should then be left vacant for a month or two or until after the first good rain.

(2) Water supplies, and, in particular, stagnant ponds, must often be dangerous sources of Johne's disease infection. Ponds should, therefore, be drained, where possible, and a water supply on more modern lines, *viz.*, a pipe-tank system, introduced. Where this cannot be done, steps should be taken, by means of fencing, to prevent, so far as possible, animals defæcating into the water pools.

(3) It is of the foremost importance that animals should be protected during calfhood. Transmission experiments have shown that susceptibility is at its height in animals less than six months of age and there can be no doubt

that calves are frequently infected as a result of close contact with their dams. To avoid this, it is recommended that calves should be removed from their mothers at birth—due care being taken, however, to provide them with adequate supplies of colostrum—and hand-reared in clean pens until they are ready to go into clean yards or on to pastures not occupied by older cattle. Incidentally, this procedure will reduce the risks of intestinal tuberculosis and scours.

(*c*) Where the history of the herd and the result of the first johnin test indicates that there is heavy infection, the owner will be well advised to consider a change for a few years in the system of farming. A particular point, to which attention is drawn, is the desirability on economic grounds of adopting the " baby-beef " system of animal husbandry and so increasing the rate of turnover. This will inevitably lead to a gradual reduction of the mass of infection on the premises and increase the likelihood of profitable farming when a return can be made to more ordinary conditions.

(*d*) If possible, the herd will be made self-contained. Alternatively, outside recruitment should be on a small scale only, should be from reputable sources and, if possible, arrangements should be made for the purchase of animals subject to the johnin test.

A certain amount of experience has been accumulated by various observers concerning the control of Johne's disease, and the results have been published. On the whole, it appears that complete eradication of the disease from infected herds is by no means an easy matter, partly because animals in the early stages do not invariably give definite reactions to the test. Owing to the prolonged period of incubation and the expense, one of the main difficulties in investigation is to follow up herds long enough to be able to judge the extent to which control efforts have been successful. In three infected herds I have been able to conduct eradication experiments for two years, but this is not long enough to know the measure of success.

Apart from complete eradication, however, it is believed that much can be done, by systematic johnin testing and isolation of reactors, to keep the disease under control. The financial outlay for testing is abundantly worth while, if only because the owner is enabled to dispose of infected animals at fair market prices before they reach the clinical stage. It should be made clear to the owner that elimination of infection from a farm is not something which can be accomplished within a few months, even when reactors are promptly disposed of. Although the aim of control measures is eradication of the disease, for the present we must be content with attempting a gradual reduction of the amount of infection on the farm, infection both within and outside the bodies of animals, so that as soon as possible the point may be reached where the disease no longer causes the owner serious direct losses. For various reasons it would be unwise to place blind faith in the test, and the owner's assistance, as well as that of the veterinarian, is essential.

Within the last two years the question has been debated by the Divisions of this Association whether Johne's disease should be scheduled. There is apparently much difference of opinion on the point among members of the profession, but the discussions are not made easier by the absence of any authoritative pronouncement as to what would be implied by scheduling. Nevertheless, most people would agree that the time has come when something should be done to prevent the spread of infection by animals in advanced stages and obviously this could only be by official action designed to enforce the early slaughter of such cases and cleansing of their surroundings.

Treatment

I do not propose to go into the question of treatment, because the matter was discussed in some detail by Dunkin in his Congress report four years ago. I would only express complete agreement with the attitude there taken up, namely, that treatment is an unsound proposition and should be attempted in exceptional circumstances only.

JOHNE'S DISEASE IN SHEEP

Shortly after Johne's disease had been diagnosed in cattle in this country by M'Fadyean in 1907, Stockman, in his annual report to the Board of Agriculture for 1909, referred to the occurrence of the disease in sheep. In a later article Stockman (1911) gave details of the *post-mortem* examination of a sheep which had died after showing symptoms of Johne's disease. The animal was from a farm where twelve out of 65 sheep had died after showing similar symptoms, namely, loss of condition and scouring after they had been put on roots. In the sheep examined enormous numbers of acid-fast bacilli were found in the thickened small intestine and considerable numbers in the large intestine and mesenteric glands. Twort and Ingram (1913), in their well-known monograph, mention that in 1913 they succeeded in cultivating Johne's bacilli from a specimen of sheep intestine.

On the Continent also, the disease has occasionally been met with in sheep. In 1918 the disease was encountered by Vudovic in Bosnia, and in 1915 by Lange and Berge in Germany. The last-named workers observed that in sheep the disease appeared to run a distinctly more rapid course than in cattle, a point which had been previously noted by Stockman. What is believed to be the first account of Johne's

disease in sheep in the United States is given by Howarth (1932), in connection with a flock of 2,000 head in California. Losses apparently due to the same cause had averaged 20 or 30 annually during the previous seven years. With regard to the symptoms, it is pointed out that the mortality was highest after lambing and that the condition might well be confused with worm infestation. Reactions were obtained in affected sheep with avian tuberculin given intravenously and in a smaller proportion with johnin. Acid-fast bacilli were very numerous in the intestine and cultures were obtained on glycerine egg containing 1 per cent. bovine tuberculin.

M'Fadyean and Sheather, in 1916, described 15 natural cases of Johne's disease in sheep in this country and also four natural cases in goats. Fourteen of the cases in sheep occurred on a farm where large numbers of sheep were kept, and there was reason to believe that the disease was being propagated as an independent disease of sheep, since no cases had been noted among the few cattle on the farm. It was not possible to say how long the disease had existed in the flock, but at least 14 other fatal cases had occurred during the previous six months, the symptoms being loss of condition and sometimes diarrhœa. The fifteenth case in their series occurred on a small farm, where Johne's disease also existed among the cattle. The history indicated that for several years on this farm three or four sheep had been lost annually, presumably from Johne's disease, cases generally occurring a little before or soon after lambing. In all these cases a diagnosis was made by finding the bacilli in the intestine microscopically and also in two cases by cultivating the organism. M'Fadyean, Sheather and Edwards (1916) carried out subcutaneous johnin tests in sheep and obtained reactions, but unfortunately sheep which were not supposed to be infected sometimes reacted also. The intradermal method of testing was also successfully used both in natural and experimental cases, the johnin being prepared with bacilli from cattle.

The disease in sheep has been reported in this country by still other observers. Dalling records (1922, unpublished communication), that he has met with Johne's disease in sheep in Scotland. In a large flock of sheep about 20 cases occurred. He diagnosed the disease by the intestinal lesions and by demonstrating acid-fast bacilli, which he believed to be the bacilli of Johne's disease. Gaiger (1932) states that he is acquainted with a farm where a few cases can generally be found in sheep. McEwen, in a private communication, informs me that he has met with the disease amongst sheep in Sussex.

Although the disease in sheep is certainly less common than in cattle, M'Fadyean and Sheather consider that the condition may be more widely distributed in sheep than is generally supposed, and they conclude that the possible existence of the disease should be borne in mind when the cause of death in sheep which have suffered from wasting and diarrhœa is being investigated. The chance of infection among sheep must also be remembered when attempts are being made to eradicate the disease from cattle.

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Discussion

There was a good attendance at the Town Hall, Llandudno, for the second session of the morning of Tuesday, September 19th, when the Experimental Pathology Section of Congress met under the Chairmanship of its Vice-President, Mr. A. L. Mullen, M.R.C.V.S., D.V.S.M.

As the reader of the paper for discussion (Dr. F. C. Minett, M.B.E., M.R.C.V.S.) did not wish to amplify his communication on the subject of "Johne's Disease, including Johne's Disease in Sheep," the Chairman called upon Major G. W. Dunkin, M.R.C.V.S., D.V.H., of Mill Hill, as the first opener of the discussion.

Major Dunkin said:—

There are several ways in which the discussion on a scientific paper may be opened and they depend not only on the outlook of the opener but also to some extent an the circumstances under which the paper was written, as

well as the composition of the audience before whom it is to be discussed.

This is only the second occasion when the Congress deliberations have been divided up into Sections. This Section is described as that of Experimental Medicine, and it was therefore to be expected that the subject for discussion would be confined largely to the experimental side.

My first complaint, therefore, is that the paper which I am privileged to open does not appear to be concerned with that aspect. It is not in any sense a compilation of experimental records and results from which one might draw acceptable conclusions and so lead to an advance of knowledge. It is rather a reiteration of existing data and recognised facts which are known and accepted, interspersed here and there with excursions into the realms of uncertainty.

I submit, and I know my friend Dr. Minett will agree with my point of view and will realise that I raise it because I am not told from what angle the paper is written—nor indeed is it apparent—that we are entitled to expect at least a few definite expressions of opinion on a subject of such wide interest and national importance as Johne's disease. Dr. Minett has, however, seen fit to withhold from us the value of his opinion and has contented himself with a repetition of the views of others, neither commenting favourably nor criticising adversely, but leaving it to the reader to adopt which line seems to him the more proper. Not infrequently we are even left in doubt, when Dr. Minett does emerge from the more or less safe seclusion of complete silence, as to what his opinion really is and the expressions made use of only leave one in a state of uncertainty and, in some cases, despondency. An example of what I mean is to be found on page 8, in which we are told that "An indirect method of approaching the problem would be to conduct a large series of tests on animals which are certainly free from Johne's disease . . ."; yet another on the same page: "This result . . . suggests that larger increases (in skin thickness), such as those of the 'doubtful' reactions now being discussed, are due to specific or non-specific supersensitiveness"; and, finally, under the heading "Avian Tuberculin": ". . . . my experience with the double intradermal method has been that the reactions are sometimes superior to those resulting from johnin. It is not suggested, however, that avian tuberculin should be used in place of johnin, partly because it is far more likely than johnin to cause reactions in tuberculous animals."

Under the heading "Differential Diagnosis.—Tuberculosis," Houthuis, the Dutch investigator, is credited with expressing the opinion that ". . . it would appear to be an advantage . . . to inject tuberculin and johnin side by side . . . as a guide in determining whether a slight reaction to johnin is specific or not." I rather think that Dr. Houthuis' opinion has been erroneously translated, for although he has definitely stated in his recently published Monograph* that the simultaneous injection of johnin and tuberculin into the same beast would be an advantage, his reason for doing so is not that suggested by Dr. Minett but with a view to being in a position to establish the presence of either disease or of both. In a private communication to me on this very subject Dr. Houthuis says: "The meaning that tuberculous cattle would give, in a certain phase of sensitiveness, some non-specific reaction with johnin seems to be a supposition, but it has never been proved and neither seen by me."

These instances will suffice to support the contention contained in my opening remarks and will, I hope, free me from the accusation of being unnecessarily severe. Let me take them in order. Will Dr. Minett tell us how he can be sure that any particular herd of cows, or any individual bovine for that matter, is "entirely free from Johne's disease"? Scientists have been struggling for years and are still struggling with this very object in view. The suggestion is indeed fantastic. May we also be told exactly what is meant by the curious and, to me, inexplicable expression "specific or non-specific supersensitiveness"? Lastly, it is observed that although Dr. Minett has on occasion observed reactions resulting from the use of avian tuberculin which he describes as superior to those observed with johnin, it would be interesting to know whether the tests which he seeks to compare were carried out on the same animals and at the same time, as well as by the same person. The concluding statement that it is not suggested that avian tuberculin should be used in preference to johnin leaves us in considerable doubt and we should be glad to know what Dr. Minett does suggest. I submit that general statements without supporting evidence should find no place in a Congress paper.

I would like to know why "chronic streptococcus mastitis" is included among what are described as the "great plagues." Serious condition though it is, and not uncommon, I cannot bring myself to believe that it is in any way comparable with tuberculosis or Johne's disease. In support of this contention, let me quote from the Berkshire Milk Recording Society Year Book for 1933 wherein are recorded the results of an investigation into the cause of removal of cows from dairy herds for the year 1930-31. The investigation covered 470 herds, comprising 12,348 cows, and of these 3,013, or 24·4 per cent., were removed for various causes, which are tabulated. Tuberculosis, Johne's disease and wasters provided 12·31 per cent., and the tuber-

* "Bijdrage Tot de diagnostiek en bestrijding der paratuberculose." M. J. J. Houthuis. Utrecht: Kemink en Zn. 8vo. 1932.

culin test when applied regularly was the cause of 18·88 per cent., but "udder trouble" only 6·57 per cent. In the same table sterility is the cause of the highest percentage of losses (25·56 per cent.).

Will Dr. Minett inform us what information he has which will support his statement that ". . . . after the age of five years a degree of immunity develops which, in some animals, is strong enough to prevent any marked decline in condition."?

A further statement on which I should be glad of some enlightenment is the following: "In the more advanced cases it is said that the complement-fixation reaction may be of value." Which complement-fixation test is referred to and how exactly is it carried out? It is well known, of course, that this test, *per se*, is a common enough one, but when diseases are being investigated which are caused by one or other of the acid-fast group it is equally well known that the results are unreliable (at any rate in the present state of our knowledge), and although I am acquainted with the statement that this test has been used with some degree of success I am not acquainted with the method adopted, and if a further discovery in this respect has been made, now is the time to make it known.

Whilst I am in only part agreement with Dr. Minett in his desire to obtain a standard technique for preparing johnin, I submit that it would be much more satisfactory and of greater practical utility if johnin itself were standardised—in my view, a procedure possessing difficulties which are not insuperable.

Dr. Minett's method of dealing with the doubtful reactor problem is entirely novel. He suggests that herds certainly free of the disease should be tested in order to find out to what extent the non-specific reaction exists. What is the significance of a so-called doubtful reactor? Actually, of course, there should be no such category, but when they are recognised they can only be due to one of several causes:—

(1) The indifferent capacity of the animal to provide the required allergic response; (2) the inability of the observer to recognise the fine differences between reacting and non-reacting swellings; (3) johnin of indifferent potency; and (4) the existence of, and interference due to, antigenic relationship between different members of the acid-fast group of organisms.

The *first* of these causes can be dealt with, for such cases are usually those in the early stages of the disease, probably not infective and will become more sensitive as the disease progresses. The *second* is a matter of experience and can be overcome by an honest endeavour to seek the truth. If a man has made up his mind that the test is of no value or that he dislikes it, no amount of experience will help matters. In the light of recent utterances I think it is fair to say that apart from being the principal cause of disappointing results it is the platform from which most of the adverse comments on the double intradermal test have emanated, and it is due to some extent to the size and character of the swelling which appears in animals free of the disease. I have recently recorded (the article appears in the current issue of *The Journal of Comparative Pathology and Therapeutics*) the preparation of a johnin from a synthetic medium on the surface of which the Johne's bacillus had been successfully cultivated. *The medium contained no other acid-fast organisms to aid growth.* If this can be repeated, and subsequent work seems to indicate that such is the case, the bogey of the doubtful reactor will have passed away. Non-specificity does not arise in cases tested with this johnin and swellings produced by an injection of the concentrated medium alone are negligible. The *third* cause could be overcome by suitable legislation which would eliminate the unscrupulous manufacturer, but the *fourth* cause is the most difficult of all. The inter-group relationship which exists among the members of the acid-fast group is well known, and whereas some members appear to be more closely related than others, the opposite state of affairs also exists. Nevertheless, it is no reason for throwing up the sponge, for these difficulties should only spur us on to greater efforts with a fixed determination to clear them up. The tuberculin test has, in the passage of years, vindicated all that was ever claimed for it; why, therefore, should it not be possible in time to say the same concerning the johnin test? If, on investigation, it transpires that there is a clear relationship existing between the bacillus of Johne's disease and, let us say, that of avian tuberculosis, it is merely further evidence that serious work is ahead.

On the basis of the argument I have put forward, it seems to me unwise and unfair to condemn a test for any of the reasons I have enumerated, namely, *because* a minority of animals show doubtful allergic results; *because* a few operators are unable to differentiate between a negative and a positive reaction, or *because* the product is not above suspicion.

I introduced the double intradermal method of testing for Johne's disease and produced the first product to be used in this way in 1926, and since that date I have been continually and actively engaged studying the results—both my own and those of some 121 general practitioners who were kind enough to make use of it. In all, I have records of some 2,499 animals and in the majority of cases *post-mortem* results, and I am satisfied that in most cases the test, when in capable hands and carried out by conscientious men with a product of known high potency, is a good one.

What is to be our future action? Research

workers and practitioners alike must strain every nerve to improve our present technique and increase our experience so that we can go to the public and say, "If you do so and so you will rid your herds of Johne's disease," for such is the responsibility of the profession. I am, moreover, confident that these views coincide with those of Dr. Minett, with whom I have had many talks on the subject.

The Viability of the Organism of Johne's Disease.—Dr. Minett very properly makes a point of this very important factor and it so happens that it is also one of which I have had some experience. I have seen it mentioned on occasion in some agricultural journals, replies to correspondence, etc., that copper sulphate and other metallic salts in solution have beneficial results when sprayed on the soil. I have failed utterly in my attempts to destroy the organism of Johne's disease by immersion in concentrations of 5 per cent., 10 per cent. and 15 per cent. of either copper sulphate or ferrous sulphate even though immersion be prolonged for 24 hours. I consider such a procedure to be a waste of money and time.

The application of quicklime has been referred to and it is a method which I have always advocated, providing that a process of chain harrowing has taken place during which all cow pads have been thoroughly broken up. Lime is a land cleanser than which there are few better, and if the climatic conditions are suitable and fresh quicklime is used in amounts varying from one to two tons an acre, depending on the nature of the soil, the heat generated by its admixture with moisture is such that disintegration of the organism may ensue and in any case the ultimate drainage of the land is greatly assisted and the pastures cleansed. Some time ago I carried out some experiments using quicklime and the bacillus of Johne's disease in culture with a view to ascertaining whether or not the organism would be killed by admixing them. I found that the temperature which resulted when quite a small amount of moisture was added might rise to 94°C., and would remain thereabouts for some four minutes. Actually the temperature remained above 70°C. for ten minutes. It was not possible to secure cultivation from any of the tubes.

Recently Professor Jean Valtis has published a book entitled "Le Virus Tuberculeux," in which it is stated that the organism of tuberculosis is killed in ten minutes at a temperature of 70°C. It seems to have escaped the Professor's notice that 15 seconds at 71°C., as adopted in America for the new short time method of milk pasteurisation, is sufficient for this purpose. By analogy it is fair to assume, I think, that similar conditions might cause the destruction of the bacillus of Johne's disease and this might well happen on pastures, *given suitable climatic conditions,* when fresh quicklime was used.

On our farm at Mill Hill it is known that prior to our occupation in 1923 it was occupied by cattle, many of which were suffering from open tuberculosis and also Johne's disease. The land is hilly and the subsoil is clay—the best London variety—but we have succeeded in rearing, mostly from advanced cases of tuberculosis and Johne's disease, some of them *in extremis,* a small herd of cows of various breeds. These animals are healthy and free from both these diseases and have been so for the past six years. This happy state of affairs has been accomplished without elaborate drainage systems, etc. Indeed, it has been carried out under ordinary farming conditions and in a way that any small tenant farmer of limited means could adopt.

There are several points about which I should like more information, but time is too limited and I must allow time for others to speak; but I would like, in conclusion, to ask Dr. Minett for the evidence which he has to support the contention that "Transmission experiments have shown that susceptibility is at its height in animals less than six months of age."

I have no personal knowledge of the disease in sheep, but I have had some experience of it in goats, especially in the experimentally induced condition. From correspondence I have had with various people, I am tempted to think that the disease is more common in sheep than is generally believed. The fact that it is not often seen may possibly be due to the fact that the life of the sheep is relatively short.

Dr. Minett will, I hope, allow me to say in all sincerity that I believe the idea at the back of his mind in presenting this paper is to provoke a good, lengthy and profitable discussion. If I am right, it would appear that I have nicely fallen into the trap so carefully and well prepared for me.

Mr. H. Llewelyn-Jones (Denbigh), who also officiated as an opener of the discussion, said:—

It is not an easy matter to select a subject for the "National," year after year, that will be of all-round interest, and it is not the first time for Johne's disease to be "on the carpet." I wish to congratulate Dr. Minett for compiling a paper of so practical a nature. As a rule, a paper written by men in the Doctor's position, is so technical as to be of very little interest to the general practitioner, but this paper does at least make very interesting reading, though it does not add much to the practical knowledge concerning the disease.

There is no doubt that this disease is more prevalent than it used to be, but it is difficult to produce statistics to prove it.

Of all the bugbears of the general practitioner, this, in my opinion, is the greatest—it is an infectious disease, though it is not so infectious as one would be led to believe, and yet not scheduled. Whether that is right or wrong, it

is difficult to say; if it were scheduled I do not think any material progress would be made in ridding the country of it.

Present-day economic conditions would only allow advanced clinical cases to be dealt with under any compensation schemes, and I think all those are eliminated to-day without any interference from the Ministry or any local authority—so for all the benefit the country would reap, matters might as well be left as they are. The general practitioner can be relied upon to study the interests of his client in a wise and tactful manner and advise him accordingly.

Another thing which makes it one of those unpleasant complaints to meet is the fact that it is incurable, and one has, in a round about way, to admit it to the owner—and such admission does not enhance our reputation as private practitioners, or as a profession.

Furthermore, we have neither a preventative nor a curative treatment; as a matter of fact, we have nothing to offer beyond kindly advice, *viz.*, to destroy clinical cases and try and fatten those in the incipient stages, and sell them for human consumption—nothing much to boast about: certainly, as a profession, we do not "cut much ice" where Johne's disease is concerned. Dr. Minett has, however, brightened up this dismal outlook and—temporarily, at any rate—has alleviated our agony by making such an unpleasant subject interesting for practitioners—but beyond that he has not succeeded in making any of us elated or even slightly inebriated with joy. Had he, for example, come forward with a cure for the disease, I can safely venture to say that every general practitioner throughout the country—teetotallers included—would rise to drink his health and acclaim him *the* man of the century: but, alas, no such joy—we are left very much "as you were."

But to revert to the paper—statistics show that about 30 per cent. of cattle between two and five years old are infected with this disease. Of course, that sounds terrible, but it is not so bad as it sounds, for if we are given the chance to test the herds, and the owner is willing to act upon our advice, the losses need not be beyond human endurance. We have a lot to be thankful for that the disease is so insidious, for it does afford time to minimise losses, by special care and attention being given to reactors not yet showing clinical symptoms.

Symptoms.—We all know this picture when we see it, but I wonder if Dr. Minett has observed that very constant symptom, excessive licking of the skin by the patient, and, if so, whether he can account for it; also, whether he has observed an excessive wasting of the gluteal muscles, producing a marked depression or hollow on either side of the hind legs; sometimes it is almost like a fold of the skin, with no muscle in between.

The remark concerning the absence of diarrhœa in the early stages is quite true—but its presence in young cattle, 15 to 20 months old, must not always be looked upon as a clinical symptom of Johne's disease, as many such cases are really due to parasitic gastro-enteritis.

Again, many look upon diarrhœa in older animals as a symptom of tuberculosis, but in my opinion tuberculosis, by itself, seldom causes diarrhœa, and the majority of such cases—*i.e.*, those that scour badly—are cases of Johne's disease; but, as we all know, the two diseases are often met with in the same animal.

Another symptom mentioned by Dr. Minett is that of falling away in condition of second and third calves after the act of calving; I do not quite agree with him here—a good number of such cases are undoubtedly cases of tuberculosis; once the animal becomes pregnant again her condition steadily improves: exactly the same thing happens in the human being. I would like to ask Dr. Minett if an animal that has once shown clinical symptoms of the disease, and reacted to the test, and then made an apparent recovery, is a source of danger and infection to others? And does the same thing apply to a reactor which has never shown any clinical symptoms?

Another point on which I do not see eye to eye with the essayist is this: he states that the disease is less frequently seen in cows over five years old, because they acquire an increased immunity, presumably after a long period of infection. Theoretically that sounds feasible, but I cannot believe that it does actually take place in Johne's disease.

I am of the opinion that whatever immunity the animal possesses is a natural one which is capable of being fortified by proper and judicious feeding, to which I shall refer later on.

Diagnosis.—We are all acquainted with the symptoms, but I also apply differential diagnosis before coming to a conclusion and, if need be, I apply the "johnin" test, and when I do apply that I also apply the intradermal tuberculin test. That sounds simple—but it is the "reading" of the test that causes difficulty to many. I think it is more difficult to make a correct interpretation of the johnin test than of the tuberculin test. Unless you have definitely fixed in your minds what is a reaction and what is not in the tuberculin test, then you will be more befogged still when you come to read the johnin test, because I consider it more delicate; by that I mean that the various things that one looks for are less pronounced in many instances than they are in the tuberculin test and therefore more difficult to interpret, and confidence can only be gained by corroboration, *viz.*, by macroscopic and microscopic evidence at *post-mortem* examinations. I dislike the caudal fold site for any test, the chief reason being that I

get better fair play to read the test on a flat surface than I do on a fold of skin.

The busy practitioner has little time for microscopic work, and consequently relies on the test. In these important and delicate tests, both johnin and tuberculin should be standardised; in some instances I attribute the different results obtained in the same animal to a difference in the johnin or tuberculin used. I also consider the use of avian tuberculin inadvisable, as it might lead to the condemnation of an animal that is not suffering from Johne's disease.

Post-mortem Diagnosis.—Unless there are macroscopic lesions, *post-mortem* diagnosis should be left to the laboratory expert.

I would like to ask Dr. Minett what are those pinkish or slightly red little nodules or growths which are often seen on the under-surface of the spleen—they look like a small mass of minute blood vessels. Are they symptoms of Johne's disease or of tuberculosis?

Another question I would like to ask is this: Is there any relationship between the two diseases? I ask this question in view of the following points of resemblance: (*a*) one meets cases of tuberculosis and Johne's disease in which the animals continue to put on flesh and become very fat; on the other hand, one meets cases of both diseases showing marked emaciation and continued loss of condition; (*b*) both bacilli are acid-fast; (*c*) avian tuberculin will produce a reaction in a case of Johne's disease but it has been known to do the same in a case of tuberculosis—and that is sufficient reason to suspect some relationship.

I know there are certain definite differentiating features, too, but I, for example, differ considerably in many aspects from my first cousins—still, we are related.

Differential Diagnosis.—Naturally one applies the two intradermal tests to differentiate between Johne's disease and tuberculosis—if neither gives a reaction, you have probably a case of parasitic gastro-enteritis, liver fluke, or some form of toxæmia, like chronic septic metritis. The two former conditions can be detected by egg count in a sample of fæces. A keen observer of clinical symptoms can very often differentiate with a fair amount of accuracy, but this is often an acquired ability which is more accentuated in some than in others—it may be intuition. For instance, there is something about the expression on the face and shape of the head of some tuberculous animals that I could not describe on paper, and yet this is always indicative of tuberculosis.

Prevention.—It is a thousand pities that we have no preventative treatment, but as things are I quite agree that destruction of clinical cases and fattening reactors for human consumption is the only thing to do.

Six-monthly testing I consider essential. The owner who tests for Johne's disease usually tests for tuberculosis and the two tests are carried out simultaneously. Oh! but what a shock awaits the poor owner when these two tests are first applied and the result made known to him!

Then, on top of these, we have contagious abortion, so it needs great courage and a greater amount of money to establish a herd free from these three scourges—but personally I consider that Johne's disease is the worst of the three. There is some compensation to be had for chronic tuberculosis, we can inject against contagious abortion, but we can do nothing with or for Johne's disease.

It is a pity that Dr. Minett has not given us a pleasant surprise to-day by saying he *has* discovered either a preventative or curative treatment.

Treatment.—Of all the things that I have tried I find that H_2SO_4 and $FeSO_4$ still gives the best result, but only in cases which are not far advanced, and even then the patient must be kept indoors, fed on dry food, such as hay, crushed oats, bean meal, cotton cake and a ration of bone meal. The latter I consider *absolutely essential.* The amount of water given daily should be limited and contain a small quantity of wheaten flour.

(2) $Cu\,SO_4$ (camouflaged) in 5ii doses every three days has also helped to produce an improvement, along with proper feeding and watering. In very advanced cases, it only hastens death (Sir Arnold Theiler and $CuSO_4$, 1909).

(3) Intravenous injection of formalin. I have had less success with this than anything, probably because I only used it in advanced cases which invariably died.

(4) Colloidal iron. Intramuscular injection will check diarrhœa, but when you leave off the injections, sooner or later the patient begins to scour again.

I regret that I am not in a position to say anything about the disease in sheep, beyond what I have read, so I will not venture to make any comments.

I hope Dr. Minett will not reply to me in the way our much respected dear old friend, Professor Macqueen, once did to a student. It happened when I held the exalted position of Tutor of Surgery at London 30 years ago. A group of final year students were being coached when Professor Macqueen came along and asked if any of them had any questions to ask—of course, 99 per cent. of them became immediately tongue-tied and partially paralysed—but there was one of them who had an unquenchable thirst for knowledge and he immediately asked a question, to which he got a monosyllabic reply. Then the Professor said: "Anybody else got a question to ask?" Dead silence for a moment, then the same student asked another rather pertinent question—and he got a reply almost more

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curt than the first one—and the students looked at one another with traces of a grin on their faces, and the Professor looked at them and said, "Haven't any of you other gentlemen got a question to ask?" But not one of them had the courage to do so—they were by this time petrified and the thirsty student—apparently not wishing the Professor to go away with a poor opinion of that group of students—put another question to him, and this was the reply: "Mr. So-and-So, if you think I am here to answer your conundrums, you are——well mistaken." (Laughter.)

Major G. W. Sturgess (Thurnby) drew attention to the symptoms described by the last speaker, which formed a picture of a deficiency disease. The age incidence, muscular wasting, depression near loins, frequent skin licking, possibly due to irritation of the nature of urticaria, and the importance of bone flour mentioned in the treatment all pointed to a condition due to some deficiency. It seemed, therefore, that treatment in advanced cases was useless and that preventive treatment should begin in the calf, to secure proper nutrition, so that when the time came for heavy drain upon the system, there would be a better chance of resistance to infection.

Mr. W. Tweed (Sheffield) said that his experience of Johne's disease was somewhat limited, but he had two interesting cases to record.

The first was on a farm where the young cattle had been sent for grazing the previous summer to common land. On examining the herd three months after their return, five of the young animals and two cows showed symptoms of Johne's disease, and the johnin test showed two apparently healthy cows to be reactors to this test. There was no history of the disease being in this herd previously. The animals drank together from a dirty pond and the disease was cleared from the herd by providing a trough water supply and eliminating the affected animals, and the reactors to the johnin test, and had not appeared since.

The other case was in a heifer he had purchased for his own farm. She came off common grazing land and passed the double intradermal test on purchase and continued to do so until her death. She was bulled and when five months pregnant commenced to show intermittent diarrhœa and got gradually worse. He carried out the johnin and tuberculin tests together, getting a reaction to the former and a non-reaction to the latter. She was retained for six months on the same pasture with other young cattle until it was impossible to look at her about the place, but no spread of infection to the other cattle occurred. The water supply was obtained from a trough. The *post-mortem* on this heifer confirmed the presence of Johne's disease and the absence of tuberculosis.

From these two cases and other experience of the disease, tentative conclusions had been drawn (1) that the johnin and tuberculin tests did not appear to interfere with each other even when applied at the same time; (2) the disease appeared to be infectious if certain predisposing causes were present, *e.g.*, stagnant drinking ponds and common grazing land.

Mr. Spicer had recorded cases which appeared to have a bearing on the supply of minerals as a preventative, and it might well be that a deficiency of both minerals and food, often present in common grazing land, played a predisposing part, and further investigation might profitably be made in that direction.

Mr. R. E. Glover (Cambridge) said that Dr. Minett had considered at some length the means which could be adopted for the control of the disease in infected herds. He had rightly stressed the impossibility of expecting any real advancement by simply removing clinical cases as they arose and added that the application of a johnin test was essential so that early cases might be eliminated.

Possibly the time had arrived to take stock of the value of the double intradermal johnin test. He was in agreement with Dr. Minett that in that method we had a valuable aid for the detection of early cases which might show no clinical symptoms, but the investigations of the past few years seemed to indicate that the power of response of the tissues in Johne-infected animals to johnin was frequently less marked than was the reaction of tuberculous cattle to tuberculin. That was a defect which, in all probability, could not be overcome by the introduction of johnins which were more potent than those in current use. It was necessary to recognise that the johnin test was not as accurate as the tuberculin test, in that it occasionally failed to detect an infected animal.

Turning to the table on p. 3, indicating the results of Dr. Minett's tests in the field, they would note that, of a total number of 503 animals, 365 were negative, 80 were positive and 60 were "doubtful." That gave a proportion of indefinite reactions amounting to nearly 12 per cent. If they were to believe that the number of the doubtful reactions might amount to that high figure, it was self evident that any schemes for eradication, by testing and segregation, were severely handicapped at the outset. It would obviously be impossible to provide accommodation for three sets of animals. If the "doubtfuls" were permitted to remain with the non-reacting cattle, it was highly probable that some would react to a subsequent test: should they remain with the reactors, it would be unwise, should they pass on a future occasion, to re-introduce them into the clean herd. If the test could not be interpreted with a greater degree of precision than that, the weapon which they had at their command was most imperfect. They would

observe, however, that in classifying his results, Dr. Minett defined certain doubtful reactions as those in which "24 hours after the second injection, a firm, painless circumscribed swelling about the size of a cob nut or perhaps larger is present, around which no distinct œdema can be felt." The size of the swelling, together with the description of the reactions, *i.e., no distinct œdema can be felt*, gave the impression that many of those cases should have been included with the reacting class.

It was possible that difficulty had been experienced in the past on account of the size of the negative swelling resulting from the larger dose of johnin which was commonly employed. With a limited experience of the johnin test, he had found that, with a product of adequate potency, a dose of 0·1 c.c. in place of 0·2 c.c. had given as good results in positive animals, while in non-infected cattle the degree of non-specific tissue response had been considerably lessened. This fact, coupled with the use of johnins prepared in synthetic media, as advocated by Dr. Minett and Major Dunkin, should be of assistance in providing a clearer line of demarcation between negative and slight positive reactions. He felt, however, that until the test had been made more searching, or alternative methods of diagnosis have been elaborated, we should be cautious in placing entire reliance on the johnin test for the clearing of infected herds.

Mr. H. Burrow (Birkenhead) said that no doubt those who were acquainted with the *post-mortem* appearance of animals affected with Johne's disease had noticed in the carcass a peculiar whiteness of the fat along the back, and that, in contrast to a case of tuberculosis, the fat along the back of the animal was not so wasted. He presumed that the difference in the appearance of the carcasses of animals suffering from Johne's disease and tuberculosis respectively was marked in the living animal. The wastage he had referred to was rather characteristic in tuberculosis, and one of the many tests applied when it was suspected that an animal was affected with that disease.

He had a limited experience of Johne's disease, and, again, he must be taken as speaking indefinitely in mentioning the testing of beasts for tuberculosis and Johne's disease simultaneously. He suggested, however, that the application of two different tests, of such close proximity in their nature, at the same time, was asking a lot. He thought if he were doing any considerable amount of testing for the two he would prefer to do it at separate times, and not risk any chance of one test interfering with the other. He did not say that one test would interfere with the other, but it seemed rather unreasonable to expect two reactions, so closely akin, in the same animal.

With regard to treatment of land from which infected cattle had come, he would like to ask if, in addition to treatment with lime or any other germ-killing agent, it would not be wise to leave the land free from cattle for some period. He had seen somewhere—and he had advised it—that the land where infected cattle had been grazing should be left free of stock, at least for a whole winter, and preferably for a summer.

On the question of doubtful reactors, unfortunately they got them both in johnin and tuberculin testing. They were told by many people that, if an animal was a doubtful reactor, they should give the rest of the herd the benefit of the doubt, and put it down as such. He was not quite satisfied as to whether they did not do that a little too much. In testing for tuberculosis, on more than one occasion where he had had a doubtful reactor, he had left that beast in the herd, and in subsequent testing he had found no increase in the number of reactors. It might be that he should eliminate that animal, but was it always quite fair to the owner? They were, perhaps, apt to regard owners' cattle as of small value, but in exceptional herds they might be dealing with animals valued up to four figures. Were they, in such cases, to carry out the same idea of kicking them out right and left, with perhaps very little cause?

As to the scheduling of the disease, it had been sufficiently worked out, but just to deal with clinical cases only would be merely touching the fringe, although it was true that every little helped. The Tuberculosis Order had only touched the fringe of that disease. They could not say that it had been a complete success, nor could they say that it had been no help at all. In contagious abortion, beasts passed through the auction marts without there being any evidence of infection other than testing in clinical cases, but in Johne's disease they often had the evidence before their eyes, and he thought it was nothing less than wicked that they could not take any steps.

Mr. T. Wilson (Nantwich) said that one difficulty in regard to the johnin test was that the ordinary farmer, when it was suggested to him, often would not carry on with it. The question resolved itself into how they could advise the farmer where the trouble was on his farm. He had had very satisfactory results on farms where they had suffered from the disease for years. In the first place, attention to the drinking water was most important. The putting in of drinking troughs tended to reduce the risk of infection considerably. If that did not check the disease the only way he knew of dealing with it was to stop rearing young stock and buy cattle which had had three or four calves, because without doubt animals were much more susceptible to Johne's disease in the first twelve or 18 months of life.

Mr. Wilson gave instances of his experiences in Cheshire on farms troubled with Johne's

disease. On one farm attention to the land and the elimination of infected stock had resulted in clearing up the disease. They had never had a clinical case of Johne's disease on that farm since those measures were taken. On another farm, he said, they treated cattle for an outbreak of foot-and-mouth disease. Two or three cattle were badly affected with Johne's disease, and in one case where a beast had looked like dying, symptoms of Johne's disease were observed. Subsequently the animal seemed to be making a permanent recovery. It appeared to be a case of one disease affecting the other. The animal carried on for nearly nine months, doing well, and then broke down.

Had they, he asked, ever seen a case of advanced Johne's disease with the beast, at the same time, considerably affected with tuberculosis? The two were met with, he knew; but in nearly all the cases he had seen where there was tuberculosis as well as Johne's disease, the tuberculosis was only slight. He had never seen a cow badly infected with tuberculosis and at the same time with Johne's disease. There was this theory, that one held the other in check.

With regard to the statement that Johne's disease was on the increase, personally he believed that it was decreasing, and that this was due to the better conditions under which cattle and sheep were kept, especially with reference to drinking water. The disease was certainly not so prevalent in their locality. Chronic streptococcus mastitis, he thought, was a much greater scourge in South Cheshire than Johne's disease. As to treatment, he did not think there was very much worth considering except on preventive lines. He would stress the importance of attending to the drinking water, and of paying attention to the sanitation of buildings where there had been infection. It was on these lines, he thought, that they would get free from the disease.

The Reply

Dr. Minett, replying to the discussion, said he felt that Major Dunkin had administered a very concentrated dose of criticism. He would deal with as many points as possible in the time at his disposal. When the request for a paper was received from the General Secretary of the Association, he (the speaker) had noted that it was to be presented before the Section of Experimental Pathology. After consideration, he had come to the conclusion that too academic a paper should not be attempted, and in forming that conclusion, two points had influenced him. Firstly, research on Johne's disease was necessarily a slow and costly affair, and the published contributions during the last few years were not numerous, and no fundamental changes in our knowledge were involved. Had there been any outstanding advance in the experimental pathology of the disease during, say, the last ten years, he would certainly have paid a good deal of attention to it. Secondly, he felt sure that Johne's disease in cattle in its field aspects was of extreme interest to practitioners, and, therefore, that it would be a great mistake to miss an opportunity of initiating a discussion on matters of practice, which were their direct concern. He had had the satisfaction of hearing that that point of view had appealed to, at any rate, two of those who had spoken, *viz.*, Mr. Llewelyn Jones—the second opener—and Mr. Wilson. If his remarks had been expressed too generally he regretted this, but he had purposely avoided detail or extensive reference to the literature.

Major Dunkin had questioned an interpretation ascribed to Dr. Houthuis—a Dutch veterinarian, who had spent some time in this country two or three years ago. Dr. Houthuis had contributed an article to *The Veterinary Record*, in which the conclusion was definitely cited that it was advantageous to apply the tuberculin test at the same time as the johnin test. Dr. Houthuis had assisted with the testing of Herd I (Table I) and they had both been struck with one particular batch of animals which reacted to both tuberculin and johnin. He could not say whether that incident had had an enduring effect upon Dr. Houthuis's mind, but in the present state of knowledge the speaker felt that it was really desirable whenever possible to apply the two tests simultaneously.

On the question of non-specific supersensitiveness, his remarks had reference to bacteria within the acid-fast group, and particularly to the tubercle bacillus and the Johne bacillus, and to the diseases caused by these organisms. Animals affected with tuberculosis might on occasion react to products made from other acid-fast bacilli. He could say little as to the frequency of this non-specific effect, but was under the impression that it occurred more commonly with calves.

Major Dunkin had queried the statement as to the freedom of Herd A from tuberculosis and its relative freedom from Johne's disease. He could only say that he had very close knowledge of Herd A; but, if so disposed, one might equally cast doubt on Major Dunkin's statements regarding the animals at Mill Hill. The speaker held that the observations on Herd A were of value in showing how normal animals would respond to the particular brand of johnin in use.

In reply to Mr. Burrow, the essayist said that tuberculin and johnin tests could be done quite satisfactorily at the same time, two points on the skin of the neck 6-in. or 8-in. apart being selected. In the same way, the speaker's tests with avian tuberculin and johnin were carried out on the same animals, at the same time, and by the same person. The results were, therefore, definitely comparable, and statistical analysis

had shown a close positive association between the two tests. A small proportion of animals, however, reacted to avian tuberculin and not to johnin, but, as had been pointed out, that did not justify the general use of avian tuberculin in place of johnin.

Major Dunkin had expressed surprise that chronic streptococcus mastitis was described as one of the major plagues of cattle, and, in support of a contention that this was not so, had brought forward figures relating to causes of wastage in cattle. Bovine mastitis was a subject which they had been investigating for some years at the Royal Veterinary College in London, and he had no hesitation in saying that mastitis could be justly termed one of the four main plagues of cattle, the others being tuberculosis, abortion and Johne's disease. The figures relating to wastage in dairy stock could not be accepted as giving a true picture, though he would not dispute the statement that sterility was a source of greater direct loss than udder disease, even if "low milk yield" was included with the latter.

He agreed, off course, with Major Dunkin as to the advisability of controlling issues of johnin by means of a standard johnin, but he thought it would also be helpful if a standard technique of preparation could be evolved. Then there was the question of the kind of reaction which he had described as "doubtful." In spite of what Major Dunkin had said, he was still of the opinion that there would continue to be cases about which there remained an honest doubt, even though one's faculties in the matter of diagnosis were exercised to the utmost. It was in such cases especially that a knowledge of the animal's sensitivity to tuberculin might be helpful. He had expected that someone would call attention to the high proportion of doubtful reactions set out in Table I, and this had been done by Mr. Glover. This table had been compiled from results as they were noted at the time the tests were done—in some cases this was three years ago. If the test had been done more recently, he would probably have put down many of the doubtful reactions as positive, and that was why in the table doubtful and positive reactions had been added together in the right-hand column. He was in agreement with Mr. Glover in believing that even with a very good johnin they would still have a certain proportion of failures to contend with. That was why he recommended that the test should be repeated after an interval, and that in any case blind faith should not be put in the test. That did not upset his conclusion that the johnin test was a valuable aid in controlling the disease, a point on which he thought Major Dunkin had misunderstood him. As to the dose of johnin, he had not tried 0·1 c.c. of the concentrated reagent, but he had compared 0·2 c.c. doses of the reagent concentrated in the usual way to a one-tenth volume and johnin concentrated to half that strength. He had concluded that the dose of 0·2 c.c. of the fully concentrated reagent should be used, as originally recommended by Dunkin.

He understood that the complement-fixation test was useful in advanced cases, but that tuberculous animals also might be expected to react.

Another point to be emphasised was that diarrhœa and wasting in young cattle might not be due to Johne's disease, but to nematode infestation.

In connection with symptoms, there was wasting of the gluteal muscles, as pointed out by Mr. Llewelyn Jones, and also he would add, wasting of the cervical muscles, giving the animal a curious appearance as though its head were enlarged. In his view that was rather characteristic.

As to *post-mortem* appearances, he had not noticed the peculiarity of the fat mentioned by Mr. Burrow. The nodules on the spleen capsule, to which reference had been made, were regarded as chronic inflammatory formations unconnected with either Johne's disease or tuberculosis.

With regard to prevention and treatment, he was interested to hear the observations of Mr. Sturgess and Mr. Tweed on the use of minerals, and of Mr. Llewelyn Jones on the method of treatment originally investigated by Sir John M'Fadyean. Future work might show that mineral deficiency should be included under the heading "environment," to which reference had been made in the paper. On the question of "age immunity," he thought it was clear from field experience that if animals passed the second or third calving they became more able to withstand the disease, and were not so liable to pass into the clinical stage. It was Twort and Ingram, as well as M'Fadyean and Sheather, who showed that young calves were more susceptible than older ones—in fact, that the only animals which could be infected with reasonable certainly were young calves.

As to the viability of the Johne bacillus and the effect upon it of chemical reagents, it was generally agreed that the organism was a resistant one. With a reagent such as copper sulphate, the results would, of course, be influenced by the presence of organic matter. As to lime, which Major Dunkin had found to be useful for killing the organism, the results again would certainly depend upon the test conditions, and especially upon the relative amount of water used for slaking. He had also noted this in experiments with the virus of foot-and-mouth disease. He did not agree, however, with the recommendation that lime should be put on pasture with the object of reducing the number of living organisms. The effect would be so dependent on chance that he considered the proposition a waste of time and money.

Mr. Wilson had given a useful account of his experience in Cheshire, but the speaker did not think it likely that the disease was decreasing.

As to Johne's disease in sheep, he had hoped to learn something from the discussion. With material from sheep, *viz.*, the intestine and the mesenteric glands, containing very large numbers of acid-fast bacteria, he had attempted to cultivate the organism on media which were known to be suitable for the organism from cattle, but curiously enough these efforts had failed completely. The reason for this was a mystery at present, especially as previous workers appeared to have encountered no such difficulty.

A.V.M.A. PRESIDENT

Veterinary Medicine reports that, at the 70th annual meeting of the American Veterinary Medical Association, which was held in Chicago from August 14th-18th, the attendance approximated 1,400, and that there was a spirited contest for the office of President, Dr. C. P. Fitch of the University of Minnesota, and Dr. J. S. Koen of the Health Department of St. Louis, being the nominees. The former won by a comfortable majority.

The new President was born in New York State July 1st, 1884. He received his Bachelor of Science degree from Hamilton College in 1906 and his M.S. from the same school in 1909. He received his D.V.M. from New York State Veterinary College, at Cornell University, in 1911, in which institution he was assistant in bacteriology 1909-11; instructor in bacteriology 1911-13; assistant professor 1914-16; and professor in 1916-17. He went to the University of Minnesota in 1917 as Chief of the Division of Veterinary Medicine, which position he has since held.

He has long been active in the A.V.M.A. and of recent years a member of the Executive Board.

* * * * *

Three prosecutions under the Improvement of Live Stock (Licensing of Bulls) Act, 1931, were brought in Dunfermline Sheriff Court on October 5th. All respondents pleaded guilty to having kept a bull which had attained the prescribed age, and in respect of which no licence or permit was in force. A fine of £1 was imposed in each case.

* * * * *

There will be no Glasgow Summer Show next year due to the "Highland" being held at this centre. That attractive feature, the annual parade of Corporation horses, will thus have no venue next year unless the Highland Society considers holding it as an additional attraction to their exhibition.

* * * * *

According to the *Illinois Health Messenger* (August 1st, 1933) a new law "gives to the Department of Agriculture power to require the vaccination of dogs or other animals against rabies in addition to the power previously vested in that Department to quarantine dogs and other animals as a control measure against rabies. The new law imposes a fine of from $25 to $100 on persons who refuse to quarantine, leash, muzzle, and vaccinate dogs or other animals when instructed to do so by the Department of Agriculture."

THE CALCIUM CONTENT OF COW'S BLOOD*

PART II: (*a*) CALCIUM IN THE BLOOD OF PARTURIENT HEIFERS; (*b*) EFFECT OF INJECTIONS OF PARATHYROID EXTRACT, IRRADIATION, ETC.; (*c*) SOME CASE REPORTS OF MILK FEVER

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AND

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FROM

THE NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING

In Part I[1] of this paper variations in the calcium and phosphorus blood content at the time of parturition in a group of normal cows of various ages, and in a group which had received cod-liver oil, were considered.

In Part II it is proposed to discuss values for a small group of normal heifers, and for certain individual cows under special conditions. The methods used were in all cases similar to those already given.

Calcium in the Blood of Heifers

The figures given in Table I show the calcium values at the time of parturition of four normal shorthorn heifers.

It appears from these results that variation in the total calcium content of the blood at the time of parturition in heifers is entirely an individual factor, but within two to four days after calving there is in each case a definite decrease in the amount of the total calcium which is in a diffusible form.

It was possible to make phosphorus determinations on samples of blood from two of these heifers, *viz.*, Flora VIII and Flora IX.

The blood of these two heifers showed a diminished phosphorus content at the time of parturition, both of the total and diffusible form. Within three to four days of calving neither value had returned to normal and that fraction of the total which was in the diffusible form showed the greatest decrease.

Irradiation with Ultra-violet Light

The possibility of maintaining a normal blood calcium content during parturition by irradiation was investigated in the case of Carlet. Carlet was a whole white coloured cow, eight years old, due to calve with her fifth calf.

The irradiation was carried out for five weeks and continued on alternate days until the day before calving. The lamp used was a tungsten

*Part I of this article was published in *The Veterinary Record*, of March 25th, 1933, Vol. xiii, No. 12, pp. 238-245.

TABLE I

Calcium in the Blood of Heifers.

Day of Sampling.	Name of Cow.	Total Calcium Mg./100 c.c. Serum.		Diffusible Calcium Mg./100 c.c. Serum.		Per cent. of total Calcium found to be diffusible.	
		Individual Values.	Mean Values.	Individual Values.	Mean Values.	Individual Values.	Mean Values.
Pre-Calving.							
1 day before calving ...	Betty	11·3		4·9		43·3	
8 days " " ...	Winnie III	10·3	10·65	4·4	4·25	42·5	39·75
3 " " " ...	Flora VIII	10·3		3·7		36·3	
2 " " " ...	Flora IX	10·7		4·0		36·9	
At Calving.							
—	Betty	—	—	—	—	—	—
Day of Calving ...	Winnie III	11·4		(3·9)		34·0	
Day after calving ...	Flora VIII	9·6	10·5	3·7	3·7	38·7	35·5
Day of calving ...	Flora IX	10·4		3·5		33·8	
After Calving.							
2 days after calving ...	Betty	10·5		3·8		35·9	
2 " " " ...	Winnie III	11·6	10·2	3·5	3·4	30·1	33·15
3 " " " ...	Flora VIII	10·1		3·5		34·5	
4* " " " ...	Flora IX	8·7		2·8		32·1	

*14 days later the values for Flora IX were, 10·6, 3·4 and 32·0 respectively.

TABLE II

Phosphorus in the Blood of Heifers.

Day of Sampling.	Name of Cow.	Total Phosphorus Mg./100 c.c. Serum.	Diffusible Phosphorus Mg./100 c.c. Serum.	Per cent. of Total P found to be diffusible.
		Individual Values.	Individual Values.	Individual Values.
Pre-Calving.				
3 days before calving ...	Flora VIII	14·8	6·9	46·3
2 " " " ...	Flora IX	13·1	6·3	56·0
At Calving.				
Day after Calving	Flora VIII	10·8	5·3	49·3
Day of calving	Flora IX	11·3	6·0	52·6
After Calving.				
3 days after calving ...	Flora VIII	11·7	5·0	42·6
4 " " " ...	Flora IX	11·4	5·4	47·7

are,† the exposure was increased from five to 15 minutes on each side at a distance of about 18 inches. During the irradiation the hair was combed the wrong way with a curry comb to expose the skin. Carlet's calving was a difficult one and the placenta was retained until removed manually four days after calving.

There is no apparent effect of irradiation on the total calcium content of the blood of this cow, which remained very constant until the actual day of calving. The sudden drop in the diffusible calcium on the day when "springing" at the udder was recorded is interesting. It suggests that the calcium was passing into the colostrum which was then being formed. It may be significant that the further diminution shown in the diffusible calcium is so small (two days after calving) as to be within the limits of experimental error. In other cases (see Part I) the diffusible fraction of the total calcium appears to decrease proportionately more than the indiffusible fraction, but this did not occur with Carlet after "springing" was noted.

Oscar Erf[2] has reported some interesting results. He irradiated four cows with a lamp placed about 18 inches from the back and sides for ten minutes. The first was irradiated with

† We are indebted to J. O. Hickman, Esq., Micklefield Green, Rickmansworth, for the gift of the lamp.

TABLE III

Irradiation of "Carlet."

Date.	Treatment and Comments.	Total Calcium Mgs./100 c.c. Serum.	Diffusible Calcium Mgs./100 c.c. Serum.	Per cent. of Total Calcium found to be Diffusible.
Nov. 25th, 1928	Milked for the last time.			
Jan. 24th, 1929		10·88	(4·9)	45·0
Jan. 24th to Nov. 1st, 1929...	Irradiated on both sides. Alternate days for 5 mins.			
Feb. 2nd to 4th, 1929 ...	" " 7 "			
" 6th to 10th, 1929 ...	" " 10 "			
" 9th, 1929		10·66	5·1	47·8
" 12th to 16th, 1929 ...	" " 12 "			
" 16th, 1929		10·71	4·97	46·4
" 18th to 26th, 1929 ...	" " 15 "			
" 24th, 1929	"Springing" at udder			
" 26th, 1929		10·34	3·9	37·6
" 28th to Mar. 4th, 1929	Irradiated on both sides. Alternate days for 15 mins.			
Mar. 5th, 1929		10·42		
" 5th, 1929	Calved at midnight. Placenta retained. Slight mastitis in R.F. quarter.			
" 7th, 1929		8·20	3·51	42·8
" 9th, 1929	Placenta removed manually.			
April 6th, 1929		9·80		
May 4th, 1929		10·40	4·1	39·4
June 17th, 1929		10·40	4·1	39·4

a dry skin, the second with a moist skin, the third with cod-liver oil rubbed into the skin and the fourth with neat's foot oil rubbed into the skin. The total calcium in the blood of the first cow remained practically the same as before treatment: in the second it was raised from 11 to 13 mgms. per 100 c.c.; in the third from 11·4 to 14·2, and in the fourth from 11·5 to 12. The food of a fifth cow was irradiated at nine inches for five minutes with constant stirring before being given, but this produced comparatively no change in the calcium content of the blood. The effect of moistening the skin and rubbing in cod-liver oil appears to be noticeable; the differences attributed to the use of neat's foot oil, we should consider to be of no significance. The fact that no increase was shown in the total blood calcium by simple irradiation, confirms the results of our experiment with Carlet.

Injection of Parathyroid Extract—"Paroidin"

Six cows were selected for experimental treatment; three, Cherry VI, Lottie I and Doll II, to receive "Paroidin"; Winsome III, Rosie and Flora II to serve as untreated controls. Unfortunately, Cherry VI calved unexpectedly several days before her time and before any extract had been given; for this reason the analyses of the samples taken from Cherry VI and Winsome III need not be considered. Lottie I and Rosie (corresponding control) were old cows (nine-and-a-half and eleven years respectively) and heavy milkers (9,000 lb. average for four previous years and 11,000 lb. each of two previous lactation periods respectively). Doll II was the only cow in the Institute herd with a history of milk fever, and was therefore an especially good subject for experiment.

The parathyroid extract was Parke, Davis and Co.'s "Paroidin," an extract of fresh bovine parathyroid, of which each cubic centimetre contained 150 Hansen units. The injections were always made intramuscularly.

Lottie I received 3 c.c. of "Paroidin" daily for four days previous to calving, on the day of calving, and on the day following. Two c.c. were given on the second day after calving and none subsequently.

Doll II received 1·5 c.c. on the seventh day before calving, 2·5 c.c. on the sixth, 4 c.c. for the five days following, on the day of calving, and the three following days, and none subsequently.

The results are shown in Table IIIa.

No definite effect of the "Paroidin" injections can be deduced from these figures. The increase in the percentage of total calcium found to be diffusible in the blood of Lottie within three days of calving is interesting, but since somewhat similar figures have occasionally been found under other conditions it cannot be definitely attributed to the parathyroid injections. On the other hand, a comparison with the values obtained for Lottie I and Doll II at their next calving when "Paroidin" was not administered suggests that the "Paroidin" may have been beneficial to some extent. The values for both cows for the following year are shown in Table IV.

TABLE IIIA

CALCIUM IN THE BLOOD OF COWS RECEIVING "PAROIDIN" AND IN CONTROLS.

COWS RECEIVING "PAROIDIN."

Day of Sampling.	Name of Cow.	Total Calcium Mg./100 c.c. Serum.	Diffusible Calcium Mg./100 c.c. Serum.	Per cent. of Total Calcium found to be diffusible.
Pre-Calving.				
4 days before calving	Lottie I	10·9	3·8	34·6
5 „ „ „	Doll II	11·6	4·7	39·1
At Calving.				
Day after calving	Lottie I	9·4	2·8	30·1
„ „ „	Doll II	9·2	—	—
After Calving.				
3 days after calving	Lottie I	10·0	4·1	40·8
4 „ „ „	Doll II	10·3	—	—

CONTROL COWS.

Pre-Calving.				
5 days before calving	Rosie	10·5	5·0	47·9
4 „ „ „	Flora II	10·5	4·4	41·6
At Calving.				
Day of calving	Rosie	8·82	—	—
„ „ „	Flora II	9·43	3·7	39·6
After Calving.				
3 days after calving	Rosie	10·7	4·5	41·9
2 „ „ „	Flora II	9·0	3·4	37·8

TABLE IV

CALCIUM IN THE BLOOD OF COWS DURING PARTURITION IN THE YEAR FOLLOWING PAROIDIN INJECTION.

Day of Sampling.	Name of Cow.	Total Calcium Mg./100 c.c. of Serum.	Diffusible Calcium Mg./100 c.c. of Serum.	Per cent. of Total Calcium found to be diffusible.
Pre-Calving.				
2 days before calving	Lottie I	10·4	3·8	36·4
4 „ „ „	Doll II	10·5	3·7	35·1
At Calving				
Day after calving	Lottie I	9·2	3·6	39·6
„ „ „ (Slight milk fever)	Doll II	7·7*	2·3	29·4
After Calving				
3 days after calving	Lottie I	9·2†	3·2	34·7
3 „ „ „ (After treatment with $CaCl_2$ and inflation of udder)	Doll II	9·3	3·0	30·9

*Mean of six determinations differing only by 0·235 mg./100 c.c.

†Total Ca only 8·9 mg./100 c.c. more than a month after calving.

It is not usual for milk fever to develop when the total Ca is as high as 7·7 mg./100 c.c., but this cow, Doll II, was old, a heavy milker and prone to milk fever.

In the year when "Paroidin" was not given, the total calcium in the blood of Lottie was 8·9 mg./100 c.c. more than a month after calving, while Doll developed slight milk fever, which, however, responded very rapidly to treatment. It must be remembered that both these cows were old and were heavy milkers. The figures do not support the views of Stewart and Percival[3] that the total calcium is easily raised by the use of parathyroid extract, nor that the diffusible calcium is raised relatively to the total; neither does the injection of the parathyroid extract show a summation of effect as has been reported by Thölldte[4] to occur in dogs.

Dosing with Calcium Lactate

A Jersey cow which had had milk fever at two previous calvings was drenched with 50 grains of calcium lactate daily for nine days before calving, during which time she was fed upon good hay and a concentrate mixture. Just before calving she went down with milk fever, her total blood calcium then being 5·14 mgs./100 c.c. She recovered, relapsed after calving, and ultimately made a good recovery.

Dosing with Calcium Chloride

A Jersey cow which had had milk fever at two previous calvings, was drenched with 40 grains of calcium chloride twice daily for twelve days before calving. She went down with milk fever a few hours after calving, her blood showing a total calcium content of 5·6 mg./100 c.c. She made a good recovery.

Cod-liver Oil and Calcium Carbonate

The effects of feeding cod-liver oil and additional lime salts to a single cow—Doll II—may be considered. This cow had a history of milk fever, and the results of one calving, when she was given injections of "Paroidin," and of the one following, when she received no special treatment, have been already dealt with. During the subsequent season she received daily cod-liver oil and two ounces calcium carbonate for nearly two months previous to calving.

In that year Doll II showed no symptoms of milk fever; in fact, the cow's condition was the most satisfactory for several years. The results for three consecutive years are given in Table V. (Overleaf.)

It is unfortunate that we are not able to compare the effects of the "Paroidin" injections and feeding of additional lime salts with cod-liver oil, on the ratio of the diffusible to the total calcium, but it is quite obvious from the results given that the latter treatment was

successful in keeping up the proportion of the former, and if, as has been suggested, the lowering of this fraction brings about the condition of tetany, this might be suggested as a fairly simple and inexpensive prophylactic treatment in cases of possible milk fever. On the other hand, recent work by Meritt and Bauer[5] indicates that variations in serum calcium during parathyroid tetany are chiefly limited to the non-diffusible calcium, while those which are associated with different levels of serum protein involve both the diffusible and non-diffusible calcium. This would suggest an association of low serum proteins in cases of milk fever. It is, of course, obvious that no definite suggestions could be offered, or conclusions drawn, from the results of one case only.

TABLE V

Results of the Estimation of the Calcium in the Blood of Doll II, for Three Consecutive Calvings.

Date.	Total Calcium Mg./100 c.c. Serum.	Diffusible Calcium Mg./100 c.c. Serum.	Per cent. of Total Calcium found to be Diffusible.
1928. "Paroidin" Injections Given.			
Dec. 20th, 1928 ...	10·84	(3·29)	30·35
„ 23rd, 1928 ... (Calved)			
Dec. 24th, 1928 ...	9·21	—	—
„ 27th, 1928 ...	10·28	—	—
Jan. 5th, 1929 ...	10·18	—	—
1930. No Treatment Given.			
Mar. 8th, 1930 ...	10·53	3·69	35·09
„ 12th, 1930 ... (Calved P.M.)			
Mar. 13th, 1930, A.M.	7·73	2·27	29·36
„ „ „ P.M.	9·69	2·94	30·39
„ 15th, 1930 ...	9·33	3·02	32·36
„ 20th, 1930 ...	9·66	3·26	33·74
1931. Calcium Carbonate and Cod-Liver Oil.			
May 20th, 1931 ...	9·92	4·85	48·9
„ 22nd, 1931 ... (Calved)	8·06	3·60	44·6
May 24th, 1931 ...	7·30	3·07	42·1
June 4th, 1931 ...	9·35	—	—

We are indebted to Mr. G. L. Peskett for all the figures for Doll II for 1931.

Earlier in this paper (Part I) the difficulty in getting blood samples from milk fever patients in this neighbourhood was mentioned. Calcium and phosphorus estimations were made on the few samples which were available and the results are given in Table VI.

In these cases of milk fever from which it was possible to get blood samples, the total blood calcium was only once found to be above 6 mg./100, while the diffusible calcium was always below 3 mg./100. The high values for the percentage of the total calcium which is in the diffusible state seem at first sight to negative the suggestion previously made (see Part I) that in milk fever cases it is the diffusible calcium which shows the relatively smaller value, but it must be remembered that these determinations could be made only on isolated samples and the percentage of the total calcium which was diffusible before and after parturition is not known; the differences shown even in this

Calcium and Phosphorus in Cases of Milk Fever

TABLE VI

Calcium and Phosphorus in the Blood of Cows suffering from Milk Fever.

Name of Cow or Owner.	Calcium. Total Calcium Mg./100 c.c. Serum.	Calcium. Diffusible Calcium Mg./100 c.c. Serum.	Calcium. Per cent. of Total Calcium found to be diffusible.	Phosphorus. Total Phosphorus Mg./100 c.c. Serum.	Phosphorus. Diffusible Phosphorus Mg./100 c.c. Serum.	Phosphorus. Per cent. of Total Phosphorus found to be diffusible.
Dairylike Beauty	5·14					
Holloway	4·83	1·24	25·67			
Prescott	5·70	2·89	50·70			
Bowyer	5·14	2·09	40·66			
Borice	3·83	2·12	55·35			
Powney	6·6	2·71	41·06	9·4	(3·9)	41·1
Fifie Mistress	4·83	2·35	48·65	8·6	(4·3)	50·2
Benyon	4·69	1·99	42·43	6·6	2·1	32·1
Ruffle (Doubtful) *...	9·93	3·67	37·05			

*Ruffle appeared to be unable to rise after calving, and it was suggested that she might be suffering from milk fever. A determination of the blood calcium values showed that this was not the case. When, later, she got up, she was found to be lame.

small number of cows are so great that it is quite obvious that many more cases need to be investigated before a decision on this point can be reached.

The values for phosphorus are not necessarily indicative of milk fever when considered separately, except possibly in the case of Benyon. No value for total phosphorus as low as 6·6 has ever been found for a normal cow, and the only other value of 2·1 for diffusible phosphorus was also obtained in a milk fever case (see Doll II, Part I, Table V).

Use of Calcium Chloride Injections in Cases of Milk Fever

Reports of some of the cases of milk fever on which blood calcium determinations were made, and their response to treatment with calcium chloride injections, may be considered. A large number of cows have now been treated in this manner and it can be claimed that, without exception, the patients have improved under it; in general, great improvement has very quickly been shown. It has been noticed that cases having the most aggravated symptoms are the ones which show the most marked and rapid improvement, usually the animal is obviously better even before the completion of the injection, breathing is deeper and more regular; in a few minutes they are generally able to sit up without support, and soon after are able to rise. The following are typical cases:—

W. . . . . .

Red shorthorn dairy cow. Had milk fever on calving in 1929, was treated by inflation, and recovered. In 1930, she was against attacked after calving, was treated by inflation, but remained unconscious for 24 hours. At the expiration of this time she was given 150 c.c. of a 10 per cent. solution of calcium chloride intravenously. In 15 minutes she was sitting up, drank a pail of water, and made a good recovery.

Fifie Mistress.

A pedigree shorthorn cow, calved on March 14th, 1930. On the following afternoon was found unable to rise; her temperature was 99·5°F. She appeared drowsy but was not comatose. She was given 150 c.c. of a 10 per cent. solution of calcium chloride, and in about ten minutes was walking down the shed. Unfortunately she was milked out too completely, and relapsed the next day, but with further treatment she made a complete recovery.

Powney.

A dairy shorthorn cow, calved on November 1st, 1930, was seen late at night on that date and appeared normal; was not seen again until the next morning, about 7 a.m., when she was in a state of coma, lying on her side, and tympanitic. Her owner said she was "nearly dead." She was given 200 c.c. of a 10 per cent. solution of calcium chloride in the jugular vein as she lay; during the injection her breathing became noticeably deeper and she was heard to sigh. When the injection was completed, her head was lifted, she gave a struggle and sat up; in a few hours she was on her feet and made a complete recovery.

Dairylike Beauty.

A pedigree Jersey cow, due to calve July 24th, 1928. She was given one ounce cod-liver oil from May 23rd until May 30th, when it was increased to two ounces daily, and on June 30th to three ounces daily. She calved on July 18th, six days before time. On the 20th she was found down, nearly unconscious, temperature 99·8°F. and bowels constipated. Fifty c.c. only of a 10 per cent. solution of calcium chloride was given intravenously. In a few minutes she was holding up her head and taking notice of her calf. In two hours she was on her feet and made an uninterrupted recovery. The values shown in Table VII (overleaf) for two cows which were given calcium chloride injections are interesting.

It is noticeable that, although both the total and diffusible calcium values for these cows are fairly normal within five to six days of calving, yet the proportion of the total calcium which is in the diffusible state is still lower than at the time of parturition, while the phosphorus has returned to normal.

The intravenous injection of calcium chloride is now always, with us, a routine practice in cases of milk fever. Inflation of the udder is only carried out after improvements have been shown with the previous treatment. No sloughing at the point of injection is ever found to occur if the injection is given very slowly and there is no escape of solution under the skin. Recovery always results, often with dramatic suddenness.

Lack of Mineral Salts in Food and Milk Fever

In Part I of this paper reference was made to a Jersey cow (Beauty of Beauchamp) which developed slight milk fever although she had received a certain amount of cod-liver oil. She belonged to a herd in which milk fever was fairly prevalent and it was thought that possibly her food might prove to have been deficient in minerals. Determinations of the amounts of calcium and phosphorus in the bran, oats, grass, hay and meal upon which she was fed were made, and it was found that both the hay and grass were low in calcium, and the grass was also low in phosphorus.

A farmer noticed that when he grazed his dry cows on a certain meadow, many of them developed milk fever at calving. Analyses of the grass of this meadow from samples taken

TABLE VII

			Calcium.			Phosphorus.		
Day of Sampling.	Name of Cow.	Details of Injections.	Total Calcium Mg./100 c.c. Serum.	Diffusible Calcium Mg./100 c.c. Serum.	Per cent. of Total Calcium found to be diffusible.	Total Phosphorus Mg./100 c.c. Serum.	Diffusible Phosphorus Mg./100 c.c. Serum.	Per cent. of Total Phosphorus found to be diffusible.
At Calving.								
Day after calving	Fifie Mistress	150 c.c. of 10 per cent. solution $CaCl_2$ intravenously	4·8	2·4	48·7	8·6	(4·3)	50·2
" " "	Benyon		4·7	2·0	42·4	6·6	2·1	32·1
After Calving.								
6 days after calving	Fifie Mistress	—	9·3	3·6	38·8	11·5	(6·7)	58·3
5 " " "	Benyon	—	10·5	4·3	40·6	14·1	6·1	43·1

during June showed that the percentage of lime was about normal, but that the phosphorus was very high. It is suggested that the exceptionally high phosphorus content of the grass prevented the cows from absorbing sufficient lime. This suggestion is supported by the fact that on another farm on which the soil was deficient in lime, the cows were fed fish meal, their blood calcium was found under apparently normal conditions to be very low (7·32 mg. per 100 c.c.) and a large number of milk fever cases occurred each year. The fish meal was stopped, the milk fever cases were reduced to almost nil, and the values for the blood calcium were found to be normal under ordinary conditions.

SUMMARY

At the time of parturition decreases in the calcium and phosphorus content of the blood were shown in heifers.

No definite effect of irradiation on blood calcium at the time of parturition could be found in the case of one experimental cow.

The effect of injecting parathyroid extract was doubtful but possibly prevented milk fever in one case and caused a return to normal blood calcium values in a second. Drenching with calcium lactate or calcium chloride appeared to have no good effect. Calcium carbonate fed in conjunction with cod-liver oil may have prevented milk fever in one case and certainly improved the condition of the cow at the time of calving.

In eight cases of milk fever, the total blood calcium was only once shown above 6 mg./100 c.c., while the diffusible calcium was never as high as 3 mg./100 c.c.

Slow intravenous injections of calcium chloride solution were found to be specific in all cases of milk fever, recovery, as a rule, being remarkably rapid.

Excess of phosphorus or insufficient lime in feeding-stuffs seems to favour the development of milk fever.

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THE PROTECTION OF ANIMALS

Sir Robert Gower, M.P. (Chairman of the Council of the R.S.P.C.A.), in the course of an article contributed, under the above heading, to the October number of *The Empire Review*, quotes the records of the Society in proof of the necessity for the activities of that body in this connection even amongst a people so justly acknowledged as are the British to be a nation of animal lovers. An account of the furtherance of this work by legislative enactment is followed by reference to the schemes now in operation whereby, through the co-operation of members of the veterinary profession with local branches of the R.S.P.C.A., professional advice and treatment are made available for the sick animals of persons who cannot afford to pay the ordinary fees of a veterinary surgeon. "A moment's thought," says Sir Robert Gower, "will convince anyone that this plan is for the good of the animals, because only a veterinary surgeon can possibly have the necessary experience and knowledge for this very difficult work. The Society is greatly indebted to hundreds of veterinary surgeons all over the country for their kindness in helping the Society in this task of securing relief for sick animals."

The author concludes with a reference to the Society's campaign to secure the humane slaughter of animals required for food. "All animal lovers," he observes, "will rejoice that at long last an Act, presented to the House of Commons by Colonel Moore, a member of the Society's Council, with this object in view, has just been placed on the Statute Book."

Clinical Communications

OPEN JOINT IN THE HORSE, WITH SPECIAL REFERENCE TO ITS TREATMENT WITH LACTO-SERUM

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On August 11th I was called to see a grey riding pony which was very lame in the near hind pastern. The history obtained was that the pony had been lame for a week and was getting worse.

On examination, the pony showed acute lameness. There was no swelling, but intense heat in the pastern region. The foot was examined and found negative for pus. Forty-eight hours later the condition developed into an open joint, the opening being almost immediately below the ergot. The pony was a favourite, safe with children, and a good jumper. Therefore the owner insisted on treatment.

Owing to the pain, and resistance of the animal, also the inaccessibility of the part involved, it was impossible thoroughly to examine the extent of the injury with the animal in the standing position, and thus it was decided to attempt a speedy closure of the opening by the continuous application of lime. The animal was therefore placed in slings, the leg immobilised with a splint, and lime applied to the wound region continuously for 72 hours.

Unfortunately, this failed to have the desired effect, so the pony was removed from the slings and placed in a roomy loose-box, where it was cast and chloroformed and the injury thoroughly examined. It was only when everything was relaxed, through the influence of the anæsthetic, that it was possible to explore the extent and nature of the injury. The wound was found to be in a most inaccessible place, opening upwards in a pouch-like fashion, so that it was necessary to hook one's finger to enter the opening; and for this reason it was found that the lime, although tightly packed in the area, was never in direct contact with the actual opening. This doubtless explains the failure of the treatment in this particular case.

With the finger once in the opening it was possible to trace a course downward to the level of the superior border of the navicular bone. This opening gripped the finger.

In order to facilitate drainage, a fairly bold counter opening was made at the lowest point available, using a No. 12 Bard Parker blade. This greatly helped treatment. The cavity was flushed for 15 minutes with a solution of hydrarg. perchlor. (1-3,000). This was followed by irrigation with normal saline, and the joint then injected, by means of rubber tubing and syringe, with biniodide of mercury suspended in olive oil in the proportion 1 in 7 (according to Steffen.[1])

The whole joint was then swathed in cotton-wool and liberally bandaged.

It was intended to keep this in position for two weeks, but on the fourth day after this injection it was evident that all was not well. The synovia was still running freely and the pain, which had been easier after the injection, was getting worse. The temperature was rising, and the pony had practically stopped feeding. It was obvious that something further would have to be done, and in the normal course iodine injection would have been repeated.

It was, however, decided to try lacto-serum. This was prepared and injected by means of a fairly large hypodermic needle which was inserted, at a point one-and-a-half inches below that of the counter opening, in a slightly downward direction, a finger in the counter opening being used as a guide, by which means it was just possible to tip the needle and direct it. In this manner about 30 c.c. of lacto-serum was injected into the joint. The writer was fortunate in finding the best position, as all the serum was retained. Cotton-wool was soaked in a further quantity of serum and applied to the openings and bandaged. The pony was kept under close observation after the injection, as it was feared that the retention of such a large quantity of fluid would cause the animal additional pain and inconvenience, but beyond holding the injured leg up more there was surprisingly little alteration to be noted.

On the following morning, twelve hours after the injection, the temperature had dropped from just over 103°F. to just under 102°F., and the pony had started feeding. This was taken as a good omen. After 24 hours the bandage was removed and the wound again examined. The alteration in 24 hours was remarkable. The wound appeared almost closed and very little joint-oil appeared to be discharging. However, following the instructions of Dauvois,[2] a further quantity of lacto-serum was injected in the same manner as previously, except that it was impossible to insert a finger and guide the needle. No more was retained than filled the posterior cavity.

It was hoped and expected that this injection would put the finishing touches to what appeared highly successful treatment. The serum used, however, was that left from the first injection. This was evidently a big mistake, for with disappointment it was found that on the following morning the joint was discharging as badly as ever.

A further supply of lacto-serum was prepared and again injected by means of rubber tubing (little being retained). This was repeated 24 hours later. Improvement was noticed after

each dressing, but not so spectacular as after the first injection of serum.

By this time the pony's temperature had dropped to normal and he was feeding well. After a further interval of 36 hours the wound was again examined. This was five-and-a-half days after the first injection of lacto-serum. At this time the oil discharge appeared completely stopped and the wound was rapidly filling with healthy granulations.

At this dressing antiphlogistine was applied to the swollen fetlock and glycerin to the wound, and this treatment was continued until the wound was well on the way to recovery. In spite of the joint oil having ceased to flow the pony remained acutely lame; and the prevention of bed-sores was a big problem. By the third week from the commencement of lacto-serum treatment there was definite improvement in the lameness. The wound was healing rapidly, the pony was putting on condition and could be considered out of danger.

Concurrently with the foregoing case a similar case of open coffin joint occurred in a Shire mare, the only point of difference being that the external opening was at a lower point, in the hollow of the heel, and far more accessible. It was possible to pass one's finger to the superior surface of the navicular bone. This case was also treated with lacto-serum, but by means of rubber tubing and a syringe. About an ounce of serum was injected daily for three days, and then on alternate days for another two injections. From the first injection improvement was noted and after the fifth injection all discharge of joint oil had ceased, but it was not possible to say at what stage this occurred.

Unfortunately, the mare was emaciated and suffered from a large decubitus sore when treatment was started, and for these reasons had to be destroyed. Had she possessed reserve of condition and strength to withstand the wearing effects of pain for another two weeks, however, there seemed every possibility that this case would have had a successful issue. Nevertheless, the case served its purpose in two ways, for it was possible to make *post-mortem* examination of the affected region. In the first place it showed that the opening which was at the outset large enough to accommodate one's finger was completely closed, not allowing passage of a small probe. In the second place it showed the extent of the injury and tissues involved. The point that could be explored was posterior to the second phalanx and superior to the navicular bone and communicating with the joint between the second and third phalanx.

The preparation of the lacto-serum is quite a simple procedure. A tablespoonful of essence of rennet is added to a pint of milk, previously brought to blood heat (98°F.), and the mixture allowed to cool. This is then strained through a piece of muslin to retain the curd. The lacto-serum is then ready for use.

As stated previously, it would appear most necessary that the serum should always be freshly prepared when used.

How does it act? This question is asked by Degois in his article,[3] and he attempts in this article to explain the action. He states that the treatment is not an antiseptic one and forms an excellent medium for bacteria; and quotes de Rothschild and Mazè, who are of opinion that the serum has a cytophylactic action which reinforces cellular resistance and permits the repair of injured tissue.

In these two cases recorded, on removing the bandage a very foul odour, resembling that produced by Reading bacillus, was noticed, and the writer suggests that Reading bacilli may have played an important part in the recovery of these cases.

Unless the cases referred to by the authors cited and those detailed by the writer are coincidence, it would appear that lacto-serum promises greatly to enhance, if not to revolutionise, the treatment of one of the most unsatisfactory and baffling conditions veterinary surgeons are called upon to treat. Such being the case, our grateful thanks are due to Dr. Dauvois and his associates.

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LEAD POISONING IN CALVES

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Previous History.—Three calves (with others) were turned out to graze at nine o'clock. Nothing unusual in their condition was noted. At about eleven o'clock, however, one of them began to bellow excitedly, ran round in very short circles, fell to the ground, and within four minutes died in convulsions.

First Post-mortem Examination.—I examined the first calf on the following day. The carcass was very tympanitic. A few petechial hæmorrhages were observed in the mucous membranes of the heart, pericardium and small bowel. The mucous membrane of the rumen was detached and covered the contained ingesta.

The contents of the bowels were more fluid than normal. The liver was enlarged and of a pale grey colour with a yellow tinge. It displayed macroscopic characters of extensive fatty degeneration.

Symptoms of Second and Third Calves.—On the next day the other two calves showed signs of serious illness. Prominent common symptoms were inappetence, tenesmus and fœtid diarrhœa.

grinding of the teeth, and acute pain. There was marked nervous derangement, but this took different forms. The second calf was inclined to be violent: it tried to climb walls and was unable to avoid obstacles. The eyes were fixed in myriadiasis and there was no accommodatory reflex to changes in intensity of light. The temperature of this calf was 107°F.

The third calf lay grinding its teeth, with the head turned towards the flank. Its temperature was 102·4°F. and it was only partially conscious.

Both calves died next day, the second in convulsions, the third in a comatose condition.

[A fourth calf showed dulness and inappetence, but responded to treatment.]

Treatment.—Lead- or plant-poisoning was suspected, and treatment was as for the former—magnesium sulphate and potassium iodide in frequent and small doses. Chloral hydrate was given in gruel to relieve the pain.

Second and Third Post-mortem Examinations.—Appearances were similar to those noted in the first examination. The rumenal mucous membrane was detached, but the livers were not so extensively affected. A portion of the mucous membrane was sent to Dr. Sheather for microscopical examination and some of the ingesta and liver to Dr. Clough for analysis.

An extract from Dr. Clough's report read: "I find that lead is present. I separated approximately 1/45th grain of lead from one ounce of ingesta. In my opinion, this result and the symptoms you described leave no room for doubt that lead poisoning was the cause of death . . . . . I hardly think that the sudden onset of symptoms would be due to repeated ingestion of small amounts. I should expect in that case a gradual loss of condition."

The following is an extract from Dr. Sheather's report: "Sections show that the detachment of the mucous membrane is a purely mechanical one. There is no evidence of tissue reaction of any kind, and very little *post-mortem* decomposition. The attachment of the epithelial layer to the subjacent tissue is a very loose one, and as the epithelium of the rumen is of the stratified squamous type it is very tough and tends to cling to the contents by virtue of its very rough surface."

* * * * *

LARYNGEAL TUMOUR IN A STEER

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A Devon steer was reported to be off his appetite and breathing with difficulty.

On examination, a large tumour, about the size of a small cocoanut, was seen to be obstructing the throat and to have a somewhat pedunculated base attached to the pillar of the fauces.

It was decided to attempt to remove the tumour and the steer received two ounces of chloral hydrate previous to being cast and placed in position for operation.

Being a big unruly beast, he struggled somewhat when on the ground, with the result that the tumour became fixed over the epiglottis and breathing became impossible. Instruments being to hand, a rapid incision into the trachea was made just in time to prevent complete suffocation. A gag was then fixed into position and a chain écraseur placed round the tumour, which was grasped in long fixation forceps. The growth was successfully removed and the steer allowed to rise.

A tracheotomy tube was inserted for a few days as a temporary measure. The steer began to feed right away and fattened rapidly.

Abstracts

[A Virus Disease, of the Canary, of the Fowl-Pox Group. Burnet, F. M. (1933). *J. Path. & Bact.*, 37, 107-122, figs., 1 plate (14 refs.)]

The author studied the virus disease of canaries first described by Kikuth and Gollub [(1932). *Zlb. Bakt. I. (Orig.)*, 125, 313]. He confirmed their findings that the virus caused a uniform type of infection with a characteristic local lesion and in an infective dose it was constantly fatal to canaries. Chickens, pigeons and budgerigars were resistant to infection, but sparrows died of a typical infection, the cause of which was somewhat more prolonged than in canaries. In artificially infected canaries a local lesion occurred at the site of inoculation and occasionally a little inflammatory exudate was present in the pericardial sac. The skin was considerably thickened over the local lesion and many of the epithelial cells contained one or more acidophil cytoplasmic bodies. The standard type of inclusion body "consists primarily of a round or oval vacuole about the same size as the cell nucleus. The vacuole has a sharply defined edge and is filled with acidophil granules much more closely packed round the periphery than towards the centre."

The virus would appear to be capable of multiplication within the cytoplasm cells originating from all three primary germinal layers.

A few experiments with formalin (0·1 per cent.) and phenol (0·5 per cent.) showed the virus to be highly resistant to those agents. In filtration experiments (carried out in collaboration with W. J. Elford) with "gradacol" membranes the virus was found to be from 0·125 to 0·175 μ.

The virus, when inoculated into the chorio-allantoic membrane of the developing egg, produced lesions that bore a general resemblance to those set up by the inoculation of fowl-pox virus, but the lesions could nevertheless be readily differentiated.

XUM

A strain of fowl-pox virus, when inoculated into canaries, caused a fatal infection with lesions similar to those produced by the canary virus, and histological examination showed similar but less marked changes.

Burnet believes that the canary virus should be grouped with the bird-pox viruses on account of its resistance to formalin and phenol, its relatively large size and its ability to produce fowl-pox-like inclusions in epithelial cells.

A plate showing six microphotographs of the virus bodies, taken by J. E. Barnard in ultra-violet light by his dark ground method, is included.

T. M. D.

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[Metritis and Vaginitis in Cows caused by *B. PYOGENES*. Bühlmann, J. *Schweiz. Archiv. f. Tierhlk.* (1933). 75, No. 6.]

A case record of three cows. The first calved normally but the lochial flow did not stop and became white and ropy. On the fourth day after parturition symptoms of metritis began; there was high fever, anorexia, cessation of milk yield and straining, etc. The second cow showed similar symptoms from the tenth day after calving, within a few days of the first cow, and the third cow, calved also at about the same time, showed signs of acute metritis from the eighth day *post-partum*. These cows were treated with uterine irrigation, febrifuges and lactalbumin (subcutaneously), but showed no improvement. Then, at about the same time, all three cows developed a diphtheritic vaginitis and metritis. At this time a bacteriological diagnosis was undertaken; it indicated infection with *B. pyogenes*. Finally, the first cow had to be slaughtered, while the other recovered slowly.

Three other cows of the same herd, due to calve within two months, were treated with stall-specific *B. pyogenes* vaccine and after calving normally continued normally and showed no metritis.

J. E.

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[The Inguinal Region of the Domestic Mammals. Seiferle, E. *Schweiz. Archiv f. Tierhlk.* (1933). 75, No. 6.]

This is a detailed paper, from the veterinary anatomical institute of Zürich university, on the conformation and structure of the inguinal canal and region with particular reference to the horse. The complex anatomical arrangement is described, with the valuable assistance of six excellent figures, and covers both sexes. A paper of this kind cannot be abstracted briefly, so surgeons and anatomists should study the original, which is written in German.

The considerations with regard to surgery are discussed. A series of lymph glands are present in the inguinal region both outside and inside the inguinal canal (superficial and deep inguinal lymph glands, etc.) and act as a protection against wound infection of tissues in the region. Peritonitis is not likely to occur directly unless the tunica vaginalis of the male is opened: this constitutes an argument in favour of castration by the covered method. For dealing by operation with the various types of inguinal hernia and cryptorchidy, a sound knowledge of anatomy is essential, as different types require different operative methods.

J. E.

Annotations

Encephalitis in the Dog

Encephalitis in dogs has for long been a subject of study both by clinicians and laboratory workers. It is a subject of quite exceptional interest to the clinician, since it presents difficulties both of diagnosis and treatment which are not invariably surmountable.

In spite of much published work there would appear to be still some confusion as to the manner in which the central nervous system is attacked by the virus of distemper. J. R. Perdrau and L. P. Pugh[1] described in considerable detail an encephalitis of dogs which they sought to differentiate from distemper infection. The predominant feature observed by these workers was a perivascular cuffing principally seen in the pons and medulla as well as in the cerebellar peduncle.

A disease presenting similar if not identical histological features, although in some cases situated in other areas, has been recently described by Marinesco, State Draganesco and G. Stroesco[2] under the heading "Histopathological researches in distemper." Most clinicians will agree that all cases of encephalitis should not be attributed to distemper and the failure of Laidlaw and Dunkin (1926) to demonstrate such lesions would appear to lend additional support to the view that their presence is not an essential manifestation of the disease. Intranuclear inclusions in neuroglia cells are described by Marinesco and his colleagues, yet they were not observed by Perdrau and Pugh.

[1] *Jour. Path. & Bact.* 1930. *33.* 79.
[2] *Ann. de l'Inst. Pasteur.* August, 1933. p. 215.

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Thirty-four Years' Veterinary Work in Southern Rhodesia*

It was with some diffidence that Mr. J. M. Sinclair, who has been for 28 years Chief Veterinary Surgeon in Southern Rhodesia, complied

* J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon. *The Rhodesia Herald.* August 25th, 1933.

with the request of the Editor of *The Rhodesia Herald* for an article on veterinary work in that country. He explains that after two years' rinderpest work in the old Cape Colony, he arrived in Bulawayo in March, 1899, on a special contract to assist in dealing with glanders which was then rampant in Matabeleland. The mallein test was applied to all horses, mules and donkeys in the Province, 4,900 animals being tested. All infected stables, sheds, etc., were burned or disinfected and eventually infection was eradicated. Since then the mallein test has been applied to all equines entering the country, and it is now 20 years since the last case of the disease in Southern Rhodesia.

Shortly before his arrival in Bulawayo the Veterinary Department had completed the inoculation of all cattle in Matabeleland and Mashonaland for rinderpest. An active immunity was conferred by the simultaneous injection of virulent blood and hyper-immunised serum. When he arrived in Bulawayo the disease had already swept through the country and he estimates that at the end of 1898 the number of native cattle in Mashonaland was a little over 9,000 and the total number of cattle in Southern Rhodesia did not exceed 40,000. It may be mentioned that, notwithstanding the numerous diseases which have had to be contested by the Veterinary Department and some of which are dealt with by Mr. Sinclair in his article, the cattle population of the country at the present time is over two million head—a living memorial to the work of Mr. Sinclair and his staff.

One of the chief handicaps to this progress has been African Coast fever, which he describes as " the most difficult of all the great plagues to handle." This disease was introduced from German East Africa towards the end of 1901, and although at present the position is more favourable than for many years, it still exists in one area. Frequently Mr. Sinclair has thought that final eradication was within sight, but confesses that " it has beaten us time after time." He optimistically expresses the hope that its final eradication will coincide with his retirement from the Service!

He then deals with the outbreak of foot-and-mouth disease which mysteriously appeared in the Colony in 1931, over seven hundred thousand cattle being involved. He admits that " for some time after the original outbreak I could not see any daylight or way out. I felt that owing to the difficulty of controlling the movements of cattle, the impossibility of preventing the movements of game and other animals susceptible to infection and because of the ease with which it was alleged that infection could be carried from one point to another by indirect means, the disease must go right through the Colony. I often thought over the matter and considered whether or not to advise the Government to accept what appeared to me to be inevitable and allow the disease to go. . . ." " Fortunately, however, such periods of pessimism did not persist and their dispersal was on several occasions due to the veterinary officers engaged in dealing with the disease in various districts. Occasionally these suffered from similar feelings and then I had to assist in their dispersal. It was not long before it became evident that under local conditions the infection was not disseminated so easily as we had been led to believe, and that the main factor in dissemination was the infected animal." Eventually the method of inoculation devised by Bevan was applied to over 180,000 head which it rendered immune, with the result that within 18 months the disease was controlled, and Mr. Sinclair states: " after a good many setbacks we succeeded in eliminating all infection, and for nine months now we have been free from it."

This interesting review deals with the peculiarities presented by quarter evil, which passed through the country as " a wave of infection " in 1916, but which is now successfully combated by vaccination. It also refers to the outbreak of rabies which appeared in 1902 and was only disposed of in 1913 by regulations which provided that all dogs within a suspected area should be tied up for a period of not less than six weeks, a method which proved more effective than compulsory muzzling. Mr. Sinclair, unfortunately, only refers briefly to many other diseases of considerable interest, such as red-water, gall-sickness, tsetse-fly disease, heart-water, " three day sickness," and horse-sickness. He says sufficient, however, to indicate that " notwithstanding criticisms that have been levelled at the Veterinary Department from time to time, it has some reason to be satisfied with the work accomplished." It is to be hoped that Mr. Sinclair's review will come to the notice of the authorities in this country and will help to persuade them of the importance of an efficient veterinary service in the development of a pastoral country, whether " at home " or overseas.

Ll. E. W. B.

Good progress has been made with the English Milk Scheme. A market has been found for practically all milk for the next six months; some of it, of course, goes at manufacturing price.

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The function of the spleen has been a moot question for many years. The production of certain blood cells and purifying action upon the blood are known splenic functions. Recently it has been suggested that the spleen is an important source of antibodies and possibly also of products that antagonise the development of tumour cells.—*Science.*

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Pembrokeshire Agricultural Committee are asking the Ministry of Agriculture for a premium for the purpose of fostering the breeding and improvement of light horses.

VICTORIA VETERINARY BENEVOLENT FUND

At a meeting of the Victoria Veterinary Benevolent Fund held at the College, 10, Red Lion Square, London, W.C.1, on Wednesday, October 4th, 1933, there were present Dr. O. Charnock Bradley, Mr. J. W. McIntosh, Major-General Sir John Moore, Lieut.-Colonel P. J. Simpson, Captain Sidney Villar, Mr. W. Woods, Professor G. H. Wooldridge, Captain W. G. Wragg and Lieut.-Colonel T. Dunlop Young.

In the absence of the President, Captain Villar took the chair.

The minutes of the previous meeting, having been published in the *Veterinary Record*, were taken as read and signed as correct.

Correspondence.—(1) From Colonel Brittlebank, Major Gooch, Mr. J. Ewing Johnston, Captain Rider, Mr. A. Spicer, Mr. H. P. Standley and Mr. W. J. Young, apologising for absence.

(2) The Secretary submitted letters of thanks from Mrs. Male, Mrs. Rider, Mrs. Simpson, Mrs. Taylor and Mrs. Wooldridge for their election as Life Members of the Fund.

(3) A letter was read from Mr. A. Gofton thanking the Council for their letter of appreciation of his past services as a member of the Council.

Secretary's Report

The Secretary submitted the following report, which was approved:—

Subscriptions:

	£	s.	d.
W. W. Golding (increase)	0	10	6
W. Pauer (increase)	1	1	0
	£1	11	6

Donations:

	£	s.	d.
Mrs. Amy Dean (per Warwick Fowle)	1	0	0
J. A. Griffiths	1	1	0
J. McAllan	0	10	6
North Wales Division, N.V.M.A. (Collecting Box)	0	15	6
Shipley Bowls Competition	3	12	6
W. W. Smart	1	1	0
South-Eastern Counties (Collection)	8	0	0
A. A. Spicer	20	0	0
Royal (Dick) Veterinary College Alumnus Association	4	0	6
	£40	1	0

The donation from the South-Eastern Counties Veterinary Association represents the amount collected at the Summer Meeting of the Division held at Langley Court on August 19th, when ladies were invited.

D. B. Rodger Legacy.—Correspondence was submitted and the reply of the Secretary was approved.

Cases

45.—Widow, aged 68. This case was left in the hands of the Executive Committee.

82.—Member, aged 69, out of work; wife earns £1 a week. A grant of 24s., equal to two weeks' rent, was made in this case. Further consideration of the case was left to the Executive Committee.

104.—Widow, aged 51. Maternity nurse. Maintaining mother-in-law, aged 82. The grant of £1 per week in this case was continued.

115.—Member, aged 68. Out of work. The grant of 15s. per week in this case was continued and the Secretary was instructed to endeavour to obtain a gift of clothes for this member.

136.—Widow, aged 40. Two children at school, helped by British Legion. Unable to find employment. The Executive Committee reported that they had increased the amount of the grant from 10s. to £1 per week since the beginning of August. The action of the Executive Committee was approved and it was resolved to continue the grant of £1 per week pending consideration of the matter by the National Veterinary Benevolent and Mutual Defence Society.

156.—Daughter of deceased member, aged 30. The Secretary reported that this applicant was now in temporary employment. It was decided that no grant be made for the time being.

163.—Daughter of member, aged 73. Old age pension, but no other income. Now in nursing home suffering from spinal caries. It was resolved to increase the grant of 10s. a week to £1 per week.

166.—Widow, two children in orphanage. Applicant in sanatorium. It was decided to leave this case in the hands of the Executive Committee with instructions to consider whether the grant should now be reduced to 10s. per week. The Secretary was instructed to write to the father-in-law of the applicant asking for his interest and assistance.

169.—Widow, receives help from brother-in-law. No grant was made in this case.

170.—Widow, aged 47. Daughter, aged 21, delicate, and son, aged nine, at school. It was agreed to continue the grant of 10s. per week for the present quarter, the Secretary being instructed to communicate with the applicant's father in the endeavour to obtain assistance from him.

171.—Sister of late member, aged 49, and widowed sister. A grant of £1 a week was made in this case for the present quarter.

172.—Member, aged 66, ill and unable to practise. The Executive Committee reported that they had made a grant of 15s. a week for the past quarter. The action of the Executive

Committee was approved and the grant was continued for the present quarter.

173.—Son of deceased member, aged 16. The Secretary reported that, as authorised by the Executive Committee, he had made two grants of 10s. to this applicant. The action of the Executive Committee was approved, but it was decided that no further grant be made in this case.

174.—Wife of member. Separated, but receiving no assistance. Two boys at boarding school. Term's fees owing. The Executive Committee reported that, after very careful consideration, they had authorised a grant of £25 for the purpose of paying the school fees owing. The action of the Executive Committee was approved.

175.—Widow, aged 53. Aged mother living with her, also without means. A grant of 10s. per week was made in this case.

176.—Widow, aged 63. One son and one daughter, both married, unable to give assistance. The Executive Committee reported that they had made a grant of £1 a week for the month of September. The action of the Executive Committee was approved and it was decided that a grant of 10s. per week be made to this applicant during the present quarter.

Wortley Axe Fund.—The consideration of the conditions applying to the Wortley Axe Fund was deferred to the next meeting.

N.V.M.A. Divisional Report

LINCOLNSHIRE AND DISTRICT V.M.A.*

MEETING AT PETERBOROUGH

Discussion on Mr. Eaton's Paper

The June meeting of the above Division was held at the Angel Hotel, Peterborough, on Thursday, the 8th of the month, at 2.30 p.m.

In the absence of the President, Mr. K. J. S. Dowland, who was unable to attend owing to military duties, the chair was taken by Major F. L. Gooch. Others present were Messrs. Porter-Smith, Gooch, junr., Poles, Williams, Dickinson, Hill, Lang, Eaton, Lockwood and Harry C. Reeks, with Captain Sheffield as a visitor.

The minutes of the last meeting, having been published in the *Record*, were, on the proposition of Mr. Porter-Smith, seconded by Mr. Poles, taken as read.

Apologies for absence were received from Messrs. Dowland, Hines, Watchorn, Grasby, Bindloss, Townsend and Littler.

Consideration of Report of Reorganisation Commission for Milk.—A letter was read from the President of the Southern Counties Veterinary Society giving details of the resolution passed at their last meeting.

The Secretary was instructed to thank the Southern Counties for their letter, and some discussion followed. Finally the following resolutions were passed:—

(i) "That herds should be inspected not less than twice per annum."

(ii) "That such inspection should be carried out by the part-time veterinary inspector of the local authority."

(iii) "That local authorities should be compelled to put the Milk and Dairies Order into operation."

Sanitary Institute Congress.—The Secretary then referred to the forthcoming Sanitary Congress at Blackpool, and it was proposed and seconded that Major F. L. Gooch should, as in past years, attend as the Society's delegate.

The Differential Diagnosis of Diseased Conditions and Abnormalities of the Mouth and Feet of Cattle, Sheep and Swine, with particular reference to Foot-and-Mouth Disease

The next business before the meeting was to consider the paper on the above subject provided by Mr. George Eaton, F.R.C.V.S., of Market Harborough. The paper had been circulated before the meeting, and therefore was "taken as read."* By the courtesy of Dr. W. Horner Andrews an exhibition was made of preserved specimens from the Laboratory of the Ministry of Agriculture.

The discussion was opened by Captain W. L. Sheffield, Divisional Inspector, Ministry of Agriculture and Fisheries, the terms of his contribution being those in which he discussed the paper at the Derbyshire Division meeting, as published in *The Veterinary Record* of September 2nd, 1933 (pp. 857-858).

Mr. Lang thanked the essayist for his paper, and went on to say that he himself had seen a good deal of foot-and-mouth disease and that his greatest worry was the fear of carrying infection. He was interested to hear of the smacking of the lips in other diseases than foot-and-mouth, but thought that it would hardly be so pronounced. One did see cases of very high temperature and salivation which were not foot-and-mouth disease. If in the slightest doubt, one should always report.

Mr. Poles asked if it were possible in foot-and-mouth disease to have lesions in only one situation; either the mouth or the feet. He

* Received for publication September 19th.

* Mr. Eaton had previously presented this paper to the Derbyshire Division, N.V.M.A., at a meeting held at Derby on April 25th, 1933. It received publication in *The Veterinary Record* of September 2nd, 1933, Vol. xiii, No. 35, pp. 848-859.

asked, if diagnosis could not be sure, was it our duty to report immediately or should we wait, possibly 36 hours, taking any responsibility ourselves?

Mr. Porter-Smith said that the possibility of foreign bodies causing lesions in the mouth must not be ignored. Should we try to make a certain diagnosis or report on suspicion? He agreed with Mr. Lang that if there was any vestige of doubt one should report. They had to face the farming public and needed the backing of the Ministry of Agriculture.

He thanked Mr. Eaton for his paper, but would venture to criticise a little. Mr. Eaton had made a passing reference to foot halt as likely to be mistaken for foot-and-mouth disease. This was really an important condition, more commonly seen in the hind feet, and gave nearly as much trouble as the results of foot-and-mouth disease. With regard to "orf," or leg and lip ulceration, associated with lesions of pustular dermatitis on lip and leg, one met similar lesions on the udders of the ewes.

Another simple thing that might at first glance arouse suspicions of foot-and-mouth disease, was the red abrasion on the outside bulb of the heel frequently seen in lorry-driven cattle. Seen in a market, that might look suspiciously like a broken vesicle.

Major F. L. Gooch, after thanking the essayist and Captain Sheffield, said that the matter was entirely one of differential diagnosis, and that any remarks he made must be taken as suggestions. He himself had not actually handled a case since 1894 and he was very thankful. The whole thing was a matter of attention to minute detail. As a rule, it was the local veterinary surgeon who came into contact with a suspicious case and it was he who, if any mistake was made, had the condemnation. The advice he gave was to leave all suspected cases as far as possible to the Ministry of Agriculture, to attempt no diagnosis save in a good light, to call in a second opinion, and to report on any doubtful case.

It had been said that there were 15 diseases which could easily be mistaken for foot-and-mouth disease, including seven varieties of stomatitis. He himself could not recognise seven varieties.

An important point was to distinguish between old and new lesions. No animal without the cloven hoof could have foot-and-mouth disease, but they acted as carriers. He was not sure that hares did not have a disease similar to foot-and-mouth disease, but was certain that they acted as carriers.

An important point, after dealing with a suspicious case, was disinfection. Even ordinary stomatitis might be spread unintentionally.

He would like to propose a very hearty vote of thanks to Mr. Eaton and Captain Sheffield. This was seconded by Mr. Poles, and carried with acclamation.

Following the discussion on Mr. G. Eaton's paper, Mr. Poles suggested that an alteration should be made with regard to the date of the June meeting, which so frequently clashed with the Huntingdonshire Agricultural Show, which was attended by several members of the Society. It was decided that such an alteration should be discussed at the Lincoln meeting in October.

H. C. Reeks, junr., *Hon. Secretary.*

PEOPLE'S LEAGUE OF HEALTH

Celebration of Formation of Veterinary Council

There was a large attendance at a luncheon given at Claridge's Hotel, on Wednesday, October 18th, by the People's League of Health, when a welcome was given to the Veterinary Council of the League, and many distinguished scientists and doctors were invited to meet the members of the council.

Miss Olga Nethersole, the Honorary Organiser of the People's League of Health, who was hostess and chairman, told her guests that Lord Moynihan, a member of the League's Medical Council and a noted advocate of clean milk, had wired a "Cordial welcome to the new associates in your great campaign."

Lord Bledisloe, Governor-General of New Zealand, wrote that it was exceedingly important that the medical and veterinary professions should work in the closest contact and sympathy, for it was becoming increasingly evident that a large number of ailments (although they might pass under different names) were common to both animals and human beings or were traceable to the same origin. A letter was also read from Sir Henry Hallett Dale, Director of the National Institute for Medical Research, Hampstead, who stated that he believed that it would become increasingly clear that in many cases the shortest way to progress in the prevention and treatment of human diseases would be through the study of analogous diseases in the lower animals, and that veterinary and medical research would come in ever closer relationship.

Dr. C. O. Hawthorne, Chairman of the Council of the People's League of Health, welcomed the addition of a Veterinary Council, and said that this co-operation had been of high value in the construction of the League's report on tuberculosis and the milk supply. That report had shown clearly that an uncontrolled milk supply, as it at present existed, carried some risk of tuberculosis and other diseases when milk was used for human food. The report proposed remedies for the prevention of those evils. The League was determined to make those remedies effective.

"The League are not prepared to allow their previously published survey of bovine tuberculosis to be pigeon-holed," said Dr. Hawthorne, "and we are determined to carry our recommendations into effect. We have to do three things—first to impress on milk producers a keen sense of their responsibility and to secure their co-operation; secondly, to educate public opinion so that the public may protect themselves and their

children; and thirdly, to apply influence and pressure to the Government in order that the necessary legislation may be passed through Parliament."

Professor Sir Frederick Hobday, Principal of the Royal Veterinary College, said that the subject of tuberculosis was inseparable from veterinary science, and that the purity of the milk supply must depend eventually on the eradication of the tuberculous cow.

Sir Leonard Hill said, "Milk is one of the finest foods in the world, and at present people are being frightened away from it. Pasteurisation should be made compulsory. I have no fear that by such means the nutritive quality would be reduced. Moreover, we should use the same preventive methods with cows that we employ with people. Cows need plenty of sunshine and good food. At present there are too many dirty byres which are a disgrace to the country. We want to get rid of those filthy, dirty byres, which are hundreds of years behind the times. Cattle should be milked in the open air, and the stalls brought round to them by motor."

Sir Leonard urged people to eat far more home-produced dairy foods, such as milk, butter and cheese, in place of much of the wheat and meat imported to-day.

Dr. D. J. Mackie (University of Edinburgh), a member of the League's Bovine Tuberculosis Committee, stated that in England and Wales every year at least 4,000 new cases of human tuberculosis arise, and 2,000 deaths occur from infection caused by the bovine type of tubercle bacillus.

Dr. Mackie mentioned also that, on the average, 7 per cent. of the country's tested samples of vended milk were found to contain this organism, and that many cases of diphtheria and of enteric, scarlet, and undulant fever could be traced to infected milk.

Dr. Mackie added "Some local authorities are pressing hard for compulsory pasteurisation. If the appropriate Government departments are not willing to move in the matter then the public must be informed in the clearest possible terms about the position. It seems almost incredible that food is being sold daily with a 7 per cent. chance, perhaps a 14 per cent. chance, of containing germs capable of producing a crippling and often fatal disease."

Major D. S. Rabagliati, Chief Veterinary Officer of the West Riding County Council, spoke of the results achieved by the veterinary inspection of dairy herds in the county. Major Rabagliati urged that every local authority should have a veterinary staff engaged in public health veterinary work. "In the West Riding 95,000 cows are regularly examined at least twice a year," he said, "and we were able last year to detect between 700 and 800 cows which fell under the tuberculosis orders. As a result the percentage of tuberculous samples in the West Riding was below 3 per cent."

Suggestions put forward included the compulsory pasteurisation of all milk supplies, the improvement of the conditions under which many dairy herds are kept, and a wide extension of the system (already practised in the West Riding and several other Northern counties and in about half the English boroughs) of the periodical veterinary inspection of dairy cows. These and similar matters will be discussed by the new Veterinary Council.

Professor J. Basil Buxton, Professor S. H. Gaiger, and Mr. G. P. Male also spoke.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

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DIARY OF EVENTS

Oct. 28th.—Meeting of the N.V.M.A. Special Committee on Small Animal Euthanasia, at Liverpool.

Oct. 30th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4.30 p.m.

Nov. 2nd.—Central Veterinary Society: Annual Dinner at the Mayfair Hotel, W.

Nov. 3rd.—R.A.V.C. Old Comrades' Association Annual Meeting and Dinner, Anderton's Hotel, Fleet Street, E.C.

Aug. 13th-18th, 1934.—Twelfth International Veterinary Congress, New York.

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PERSONAL

Illness of Mr. Henry Gray.—Regret will be deep and widespread that Mr. Henry Gray, M.R.C.V.S., of Kensington, has been removed to the West London Hospital, where he is resting prior to an operation, of a somewhat serious character, to be performed within a short time. Our friend retains his cheerful and indomitable spirit, however, and we are informed that he is permitted to receive visitors.

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R.C.V.S. OBITUARY

Drabble, Charles, T.D., M.R.C.V.S., Major R.A.V.C. (T.F.) (retd.), 6, Melbourne Place, Bradford. Graduated N. Ed., December 17th, 1885; died October 16th, 1933. Aged 71 years.

The *Yorkshire Observer* records that Major Drabble died suddenly at his home shortly after he had returned from a meeting at the Greenfield Greyhound Track, and speaks of him as one of the best-known and most widely esteemed veterinary surgeons in the Shipley district.

The interment took place on October 20th, at Nab Wood Cemetery, Shipley, when the following Members of the Royal College of Veterinary Surgeons were present: Messrs. F. B. Greer, J. D. Knowles, E. Child, and E. Collins.

Taylor, John, M.R.C.V.S., 17, Gilmore Place, Edinburgh. Graduated Edin. October 21st, 1907; died October 19th, 1933.

Mr. Taylor, who was a well-known veterinary surgeon and agriculturist, took over the business of Messrs. R. Rutherford and Son, Bread Street, Edinburgh, five years after he qualified. He held the office of veterinary officer under the Department of Agriculture's scheme for the veterinary inspection of stallions, and was veterinary officer at the Scottish Kennel Club shows.

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FOOT-AND-MOUTH DISEASE: OUTBREAKS IN THREE COUNTIES

The existence of foot-and-mouth disease was confirmed on Sunday last, among cattle, sheep, and pigs on premises in the parish of Backwell, in the County of Somerset, six miles south of Bristol.

XUM

The area subject to restriction lies in the counties of Gloucester and Somerset, and includes the cities of Bath and Bristol.

Outbreaks of foot-and-mouth disease have also been confirmed near Cambridge, and a further outbreak at Great Carlton, near Louth, within a mile of the farm at Saltfleetby, where the disease was discovered the previous week. The stock markets at Louth, Alford, Horncastle, and Spilsby have been closed except for animals for immediate slaughter.

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REGIONAL VETERINARY SERVICE FOR ABERDEEN AND COUNTY

At a meeting held on October 11th, a scheme for a regional veterinary service in Aberdeen and the county was approved by the Public Health Committee of Aberdeen Town Council.

The memorandum containing the scheme mentioned that Kincardineshire, after negotiation, had declined to enter into the co-ordinated services owing to special local circumstances. Meantime the office of veterinary officer for the city is still vacant.

Hitherto the city and the county have had their independent whole-time veterinary officers. The cost of the city services during the last financial year came to £912, while the county services, exclusive of police costs, required £1,033.

The scheme proposes the appointing of one Chief Regional Veterinary Officer, located in Aberdeen, with a staff of two fully qualified veterinary officers. The Chief Regional Veterinary Officer will be under the respective local authorities and will have control of the services in both the city and county. He will assign the duties to the other officers, provided that in all matters relating to public health he will be subject to the administrative superintendance of the Chief Regional Medical Officer.

Under the scheme the Chief Regional Veterinary Officer and one assistant will be stationed in Aberdeen, and the other assistant also in the city, or at such convenient centre as the County Council may decide. The assistant stationed at Aberdeen will normally operate in the part of the rural area adjacent to the city.

Besides supervising the whole area, the Chief Regional Veterinary Officer will normally carry out the duties of veterinary officer for the city.

It is proposed that the salaries of the officers should be as follows: Chief Regional Veterinary Officer, £600 minimum, and £750 maximum; two assistants, each £360 minimum, and £450 maximum; while £150 will be paid for clerical assistance, making a total of minimum salaries of £1,470, and £1,800 maximum.

On the minimum scale the Town Council would contribute £691 and the County Council £779, while on the maximum scale the Town Council would pay £846 and the County Council £954.

Each local authority will be responsible for the payment of travelling and subsistence expenses incurred in respect of work in its area.

A revision of the financial arrangements will take place after the scheme has been in operation for twelve months.

The Veterinary Office will be at 4, Albyn Place, Aberdeen.

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"The Veterinary Journal" Poultry Number.—The breeding and diseases of poultry are subjects increasingly attracting the attention of veterinarians, and accordingly there will be wide appreciation of the current issue of *The Veterinary Journal*, which is almost exclusively devoted to them. In addition to original articles, there is reproduced a selection of papers presented at the Fifth World's Poultry Congress, and at the Annual Harper Adams College Poultry Conference. Copies of the *Journal* may be obtained, price 2s. 2d. post free, from the publishers, Messrs. Baillière, Tindall and Cox, 7 and 8, Henrietta Street, Covent Garden, W.C.2.

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HORSE SOCIETY MEETINGS

National Horse Association

Major-General Sir John Moore presided over a largely attended Council meeting of the Association, on Friday, October 20th, and referred with regret to the great loss the horse world had sustained by the death of Mr. N. W. Smith Carington, M.P., and a sincere vote of condolence was passed.

Horse Transport.—In this connection, the following resolution was passed: "The Council of the National Horse Association of Great Britain has noted with extreme regret the attempt being made in certain quarters to decry the presence of horse-drawn vehicles in the London area.

"It observes that no proper regard is had for the large number of firms which rely upon their unhampered use of horse transport, as the most economical method of delivering essential commodities, nor for the innumerable small traders and carriers utterly dependent upon it for their livelihood. It maintains that the best interests of the public would not be served by any interference with the present freedom to choose whatever form of transport that experience or research may show to be the most suitable for any particular trade or business; and it is satisfied that any traffic congestion in the London area is mainly due to a variety of causes *other* than the presence of horse-drawn vehicles.

"Finally, it condemns the agitation in so far as it urges restrictions which must re-act unfavourably on the valuable British horse breeding industry, and inflict widespread unemployment and hardship."

Traffic Advisory Committee.—The Secretary officially reported that Major-General Sir John Moore had been appointed as representative of the horse industry on the London and Home Counties Traffic Advisory Committee.

Horse Owner's Reference Book.—This book, it was stated, would again be issued in 1934, and contain up-to-date statistical and other data regarding horses and ponies. All organisers of any events in which horses and ponies could take part should send in details to the Association.

Riding Schools.—The Council noted with pleasure that horse riding as a form of exercise was definitely on the increase, and desired to express their thanks to the many riding establishments who had displayed the Association's card, resulting in so many enquiries being received for information as to where riding could be obtained, hacks and hunters hired, etc., at the seaside and in the country. Details of some 500 such places were on the records, and it was hoped shortly to obtain a full list of where horses could be hired. It was decided to incorporate in the Reference Book for 1934 a list giving the riding establishments in classified county order; later it might be possible to arrange for the issue of large-sized badges to subscribers. In view of the wide issue of the Reference Book, a small fee of 2s. 6d. only would be charged to the riding schools inserted in the classified list.

Horse Owner's Guide.—As so many new owners are now enjoying riding, the Council authorised

for press a booklet giving practical advice and help to the amateur rider. All owners, however, who take an interest in their mounts would appreciate the expert knowledge contained in the articles by well-known authorities on horse management. The book will be ready in November, price 6d.

Hacks.—Sir Archibald Weigall and Major H. Faudel Phillips proposed that conditions governing the showing of hacks might be drafted. The Council, realising that there is no breed Society that represents the interests of owners of hacks, therefore welcomed the suggestion, and appointed a Committee to draft out suggestions for the judging of hacks, and also a list of recommended judges of hack classes.

Jorrocks Clubs Association.—It was reported that this Association—a movement for the encouragement of riding and good-fellowship among riders—had approached the Association asking that they might be absorbed into the Association, as they felt that their objects could better be undertaken nationally. The President and President-elect were appointed to discuss the matter with the Jorrocks Clubs Association.

Ploughing Matches.—It was decided to issue certificates at Ploughing Matches to the driver of teams where the horse is well looked after, properly groomed and the harness clean. Organisers of Ploughing Matches should get in touch with the Association.

Motor Horse Boxes.—The Road and Rail Transport Bill should shortly receive the Royal Assent, under which it is clear that a private person hiring a motor horse box and having it driven by his own chauffeur will not be subjected to the numerous conditions attached to the licence, but if the individual is using it in connection with a trade or business (whether that business is horse breeding or not) a licence will be necessary. The Council considered that motor horse boxes ought to come under the present definition of an agricultural vehicle, as horse breeding is an important agricultural industry.

Bridle Paths.—The Rights of Way Act, 1932, comes into force at the end of the year, and seeks to remove the present difficulty and expense which faces the public in proving its claims to bridle paths and footpaths. Local authorities are, therefore, scheduling public rights of way, and there is a danger that many bridle tracks will be overlooked. Horse riders should, therefore, see that their local authorities do not lack information with regard to tracks for riding. If old public bridle tracks have become obstructed, riders should get in touch with the Association.

Medals.—It was reported that 38 silver medals had been awarded this year for the best child's pony, and seven had been awarded to farriers in shoeing competitions for the best-fitted shoe. Medals have also been awarded to farriers and owners of the best-shod horse exhibited at agricultural shows. A special committee was also appointed to revise the list of recommended judges of children's riding ponies.

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Shire Horse Society.

In opening a meeting of the Council of the Shire Horse Society held at 12, Hanover Square, on October 17th, Mr. A. Thomas Loyd (President) referred to the great loss which the Society has sustained in the sad death of their colleague and friend, Mr. N. W. Smith-Carington.

Mr. Smith-Carington's long connection with the Society dates from the death of his father—a Past-President—and for many years he had occupied a seat on the Council, and was President-elect in 1930 and President of the Society in 1931. Not only Shire men, but horse owners and breeders generally would mourn the loss of a gentleman who always showed himself so happy in his self-appointed task as the horse owner and breeder's champion.

London Show, 1934.—This annual event was fixed to be held at the Royal Agricultural Hall on February 20th, 21st and 22nd next, and in pursuance of their usual policy of extending the maximum amount of support to exhibitors, the Council agreed to repeat the 1933 Schedule in its entirety. This means that a sum of £1,775 will again be offered in six classes for stallions, six for mares, three for geldings and six for commercial horses.

The 1933 programme would also be repeated, and amongst the appointments made was that of Mr. T. Eaton Jones, F.R.C.V.S., as Chief Veterinary Officer.

Royal Show, 1934.—In view of the fact that the three important East Anglican Shows will be merged into the Royal Show at Ipswich next year, the Council gave consideration to the best means of affording full opportunities for the exhibition of Shires in East Anglia, and it was unanimously agreed that the Royal Show at Ipswich offered the best facilities in this direction. The Horse Show Committee's application for an additional £500 for this purpose was agreed to, so that apart from the £245 offered by the Royal Agricultural Society of England in prizes for Shire horses, a further sum of £600 would be distributed to exhibitors at this show next year. In addition, there will be the usual gold medals, and on this occasion a silver cup, which Sir Walter Gilbey has generously offered to provide for the best team.

Country Shows, 1934.—A statement was submitted showing that a sum of £700 had been expended during the current year in providing special prizes at shows throughout the country, and it was unanimously agreed that such offers be renewed *en bloc* in 1934.

New Members.—Sixty-four new members were elected.

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Hunters' Improvement Society

At a meeting of the Council of the Hunters' Improvement and National Light Horse Breeding Society held in London on October 6th, Lord Digby presiding, 32 new members were elected.

Mr. F. H. Unwin reported that during the past show season, 33 gold medals and 141 silver medals had been awarded at associated country shows. In addition, 39 produce premiums of £1, and nine premiums of £2 had been awarded for groups by the same sire.

The President reported the steps he had taken in regard to applying for a renewal of the grant for light horse breeding, and intimated that he had placed before the Government the full facts of the present position. Nothing definite had, however, been decided, but he hoped that he might hear something definite before the next meeting of the Council.

The date of the next London show was provisionally fixed for Tuesday, Wednesday and Thursday, February 27th, 28th and March 1st, 1934, and the schedule of classes for the Hunter section adopted. In addition to the usual classes for young stock and ridden hunters, a new class for ladies' hunters to be ridden side saddle was included.

XUM

The Council considered letters from Hunter breeders in regard to the veterinary examination of Hunter brood mares at country shows, emphasising that breeders regretted that at certain shows brood mares were veterinarily examined again and again during the year, and that they considered this very detrimental to the mare and foal. The Council decided to issue veterinary certificates for brood mares, which would be for one year only, and only after the mare had been examined by the officially appointed veterinary inspector of the Society for each county.

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RADIUM TREATMENT OF CANCER

In the fourth annual reports of the National Radium Trust and the Radium Commission, published on October 18th, it is stated that in 1930 1,700 cancer patients were treated by means of radium at the various national centres. For the two succeeding years the numbers were considerably increased. Their records will be available for statistical research, and they will be augmented by the fact that the King's Fund is acting in collaboration with the Commission.

"The Commission has come to the conclusion," it is added, "that not less than five years must elapse before an answer can be given to the question as to how much value can be attached to radium treatment in cancer. It is hoped that an interim report may be made at the expiration of three years, and that this may suggest the best methods of irradiating cancer in certain sites of the disease.

"It is felt that this work of the Commission will provide an opportunity to evaluate the results, on a scale not hitherto attempted, of the treatment of cancer by radium therapy. Other side issues will no doubt also emerge, such as the distribution of and the time relations of the appearance of metastases in other organs.

"In view of the importance of comparing the results of radium treatment with those attained by excisional surgery in cancer, it has recently been decided that certain hospitals shall be invited to furnish statistics in an agreed form of the results obtained by surgical treatment only."

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ARMY VETERINARY SERVICE

R.A.V.C. Promotions

Lieut.-Colonel William H. Walker, D.S.O., O.B.E., is promoted Colonel in place of Colonel J. J. B. Tapley, D.S.O., who goes to the half-pay list.

The new colonel is 50. He has been in the R.A.V.C. since 1906, at the Curragh, Lucknow, with the Egyptian Army, in the Sudan, France, Persia, Delhi, London, and now in Egypt. He has been D.A.D. in India and A.D.G. at the War Office.

Major John O. Andrews, D.S.O., who is D.A.D. of Veterinary Services Deccan District at Bolarum, is promoted to the corps vacancy for lieut.-colonel. He is 50, and has 27½ years' service, having been a temporary lieut.-colonel in 1918-19 and instructor at the Equitation School. He was at Shorncliffe before going to India.

London Gazette—War Office—Regular Army

Oct. 17th.—Capt. W. S. B. Clapham, S. Afr. Vet. Corps, is granted the local rank of Capt. (Oct. 2nd) with seny. Feb. 16th, whilst empld. on mil. duty in the United Kingdom.

October 24th.—Major J. O. Andrews, D.S.O., to be Lieut.-Colonel (October 25th).

THE WORLD'S MOST PROLIFIC SOW

"On September 12th the world's most prolific sow farrowed her 20th litter with 14 pigs, bringing the total number farrowed to 367," says *The Scottish Farmer*. "The sow, which is a Large White, belonging to Mr. Harry S. Pendlingham, Hardwicke, Colwall, near Malvern, has firmly established for a British breed of pig a world's record for prolificacy which is now definitely considered to be unbeatable. Moreover, the farrowing of 20 litters by one sow is in itself claimed to be a record. The sow, which is now ten years and nine months old, was farrowed in January, 1923, producing its first litter on December 12th the same year. She has produced a litter well above the usual average number each and every six months, including two litters of 24, one of 22, one of 20, three of 19, three of 18, three of 16, one of 15, one of 14, and one of twelve. Experiments carried out by Messrs. F. G. Martin and Sons, The Pyke House Research Station, Tewkesbury, with offsprings from the sow's earlier litters have given interesting results, conclusively proving that the remarkable prolific qualities have been passed on to its offspring. A gilt farrowed on July 19th, 1929, broke its dam's record over a given period; another has averaged 16 to a litter and a young boar (which is not yet fully grown) measures 8-ft. 6-in. from snout to tip, and has a truly remarkable breeding record to its credit."

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H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses: London: Adastral House, Kingsway, W.C.2, and 28, Abingdon Street, S.W.1; Cardiff: 1, St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120, George Street.

	Price Net. s. d.	*Post Free.* s. d.
Medical Research Council:—		
Special Report Series:—		
184. The Eradication of Bovine Tuberculosis. July, 1933. (45-5-84)	2 0	2 2
Agriculture for Scotland, Department of:—		
Journal. Quarterly. Vol. xvi, No. 4, October, 1933. (49-12-4-33)	1 0	1 2

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QUARANTINE STATION THREATENED.

Public funds for the carrying on of the London Quarantine Station cease with the termination of the work of the Empire Marketing Board, and the present arrangements provide for carrying on the station only to Christmas.

Recognising that the closing down of the station would be a calamity to the pedigree export trade, the Royal Agricultural Society, who have managed the station on behalf of the Empire Marketing Board, sent a deputation consisting of Sir Merrik Burrell and Mr. T. B. Turner (secretary), to the Ministry of Agriculture recently. They found that the cessation of funds is definite and irrevocable, although the Ministry is most anxious that the station should be carried on.

The representatives of the R.A.S.E. agree to explore further possibilities of carrying on the station without public funds, and will probably approach the Ministry again if any new plan should be devised.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

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CLEAN MILK PRODUCTION AND BOVINE TUBERCULOSIS PREVENTION

To the Editor of the Veterinary Record

Sir,—Sir Leonard Hill, speaking at the luncheon at Claridge's Hotel, in connection with the Clean Milk Campaign of the People's League of Health, on October 18th, is sensationally reported in to-day's daily Press under such headings as "Filthy Cattle Byres—Sir Leonard Hill's attack." Quotations from his speech refer to the paramount need for sunshine, fresh air and cleanliness. For example, "We want to get rid of these filthy, dirty byres which are hundreds of years behind the times." Similarly, at the Leicester gathering of the British Association, medical men are reported in the daily Press to have spoken as though these were the chief, if not the only factors, in the prevention of bovine tuberculosis as well as in the production of clean milk.

True in part as these views and statements are, they tend, I think, to mislead not only the lay public, but the rank and file of the urban medical practitioners. The conclusion that any member of the public might reasonably draw from these speeches is that mechanical hygienic reform alone is needed to put everything right. Thus the issues are confused, and goodwill and energy are diverted from the main factors—the only factors—which can achieve the desired end, the factors of complete veterinary control and scientific feeding.

If eminent medical men wish to help us, as indeed they can, to prevent diseases of cattle and to produce clean milk they can best use their prestige and their eloquence on suitable occasions by telling the public that the matter is primarily and essentially one of veterinary control. Let them, as they truthfully may, assure all concerned that the results of this control will depend upon the extent to which it can be made economically possible to establish an efficient veterinary service, and to give effect to its recommendations, which will naturally include the several sub-factors of sunshine, ventilation, cleanliness, and feeding. Apart from this, the medical profession can help, and help abundantly, in research into problems of nutrition, and pathology, and biochemistry *in the laboratory*. But medical men have not, on the whole, as we have, the opportunities for observing the incidence of tuberculosis and other diseases of cattle under the most variable conditions of sanitation, management and climate, *in the field*.

It might fairly be assumed, for example, from the speeches of Sir Leonard Hill and some of his colleagues, that tuberculosis of cattle must (by inference concerning the alleged influence of dirty surroundings and deprivation of sunshine) be far more rampant in most parts of rural Ireland than in the South Sea Islands where cow-houses or byres are rarely used and the sun shines most of the time. Whereas it is just the opposite.

In a virgin field of veterinary investigation in some of these islands I found, as the result of a systematic abattoir *post-mortem* examination of cattle in one district, an incidence of over 30 per cent. of tuberculosis in gross naked-eye lesions. These cattle had never been stabled and had basked from birth in brilliant sunshine. In the beautiful island of Taviuni, in idyllic circumstances of abundant sunshine, clean paddocks, and the freshest air, it was revealed in the course of inspecting some thousands of cattle that had never been stabled that tuberculosis was prevalent—so prevalent, indeed, that in some herds 20 per cent. of the animals were obvious clinical cases needing destruction or segregation; so prevalent that I had difficulty in finding in one of the best herds one cow that would pass the tuberculin test to meet the request of the Governor of the Colony who asked me to send him a healthy cow from this herd to the capital.

So far as the South Sea Islands are concerned, these investigations proved that the paramount factors causing the spread of tuberculosis in cattle were absence of clinical control, inadequate feeding, and humidity.

The humidity if these islands in some areas varies greatly in accordance with variations in the rainfall and this factor, rather than sunshine, clearly determined the varying incidence of tuberculosis and the extent of individual resistance to the ravages of the disease.

It was not possible at that time to determine how the humidity acted, whether by preventing the dessication of infective material, or by modifying the nutritional composition of the pasture, or both.

The incidence of tuberculosis and the extent of the infection in individual animals were demonstrably greater in herds that had been bred from fine European strains than in herds where Zebu bulls from India had been used. The conclusion formed at the time was that this fact was due partly to the greater ability of the Zebu to maintain a normal metabolism in a tropical climate on a dietary of tropical herbage, and partly to the far less development of the mammary gland function in that breed.

There was no demonstrable difference in the incidence of tubercle in the three prevailing European breeds, which were Shorthorn, Hereford, and Friesian. Some of the original coconut planters had preferred one or other of these breeds, and herds of a thousand and upwards had been built up on a fairly pure-breed basis.

These observations are, it is thought, a sufficient illustration of the danger of talking about sunshine, or fresh air, or elaborate byre construction, as the main preventive factors in the control of tuberculosis in cattle. The things to talk about are veterinary control and scientific feeding. If we can take care of these sovereign remedies the pennies of the sub-factors will take care of themselves.

Yours, etc.,

October 19th, 1933. Wakefield Rainey.

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ANIMAL PSYCHOLOGY

To the Editor of the Veterinary Record.

Sir,—Your correspondent, J. N. H. Bacon, in to-day's *Record*, discusses a subject of growing importance to our profession. Debates can easily run riot when human and animal psychology become intertwined, as they invariably do.

The question of pain and suffering in animals ranges from discomfort to agony. Cruelty, as your correspondent says, is not easy to define. The bench and professional witnesses encounter many practical difficulties when dealing with these cases. A court-house is not a suitable venue for academic discussions. As a practical guide, Professor Craig's evidence will, no doubt, be noted by the bench generally. We are indebted to him for a clear exposition of his opinion on a difficult question.

Yours faithfully,

A. G. Doherty.

Martinstown House,
The Curragh, Co. Kildare.
October 21st, 1933.

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BRIDLE TRACKS: THE RIDER'S HERITAGE

To the Editor of the Veterinary Record.

Sir,—The National Horse Association would like to remind all your readers who are interested in horses and riding of the urgent need to put at the disposal of their local authorities any special knowledge they may possess of local bridle tracks.

The Rights of Way Act, 1932, which comes into force at the end of this year, seeks to remove the present difficulty and expense which faces the public in proving its claims to footpaths and bridle tracks. It also enables landowners to obtain more easily recognition of their right to stop up such ways and tracks if, in their view, they should not be public.

This is why, on the advice of the Commons, Open Spaces and Footpaths Preservation Society, almost all local authorities are scheduling at the present time the various public rights of way which exist in their areas. Obviously, however, there is a very real danger that many bridle tracks will be overlooked, especially if only used occasionally, or not at all, in recent years.

Lovers of riding should therefore bestir themselves and see that their parish councils (or other appropriate local authorities) do not, at this vital juncture, lack any information they should have with regard to bridle tracks, either ancient or modern. They should also ensure that in any maps of public rights of way which are being compiled by local authorities, all tracks which are legally bridle ways should be shown as such. If riders have any difficulties in this respect, or come across any ways which there is good reason to believe are public bridle ways, but which are obstructed, or have surfaces unsuitable for horses, it would be well for them to get in touch with this Association, in order that the matter may be, if necessary, taken up with those responsible.

As the popularity of riding (schools), riding holidays, riding generally is increasing simultaneously with the urbanisation of large areas of the country, the urgency of the matter for present and future generations of riders is obvious.

Yours very faithfully,

R. A. Brown.

The National Horse Association of Great Britain,
12, Hanover Square,
London, W.1.
October 18th, 1933.

The Editor acknowledges, with thanks, the receipt of the following:—

Reports of meetings of the Midland Counties and Southern Counties Divisions, N.V.M.A., from Messrs. H. W. Dawes, and J. B. White, respective Hon. Secretaries. Communication from Mr. E. G. Conisbee (Kimbolton).

Diseases of Animals Acts, 1894 to 1927

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th Oct., 1933	7	7	4	397	1	1	8	45	33
Corresponding period in									
1932	5	5	2	143	2	2	5	35	13
1931	12	13	1	166	3	3	10	74	33
1930	7	9	—	—	2	3	16	81	45
Total 1st January to 15th October, 1933	224	253	69	6,520	116	193	288	1,114	682
Corresponding period in									
1932	268	331	12	1,093	109	169	174	1,330	642
1931	380	425	97	10,649	120	216	224	1,541	650
1930	289	320	7	299	179	272	310	1,931	844

Note.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.